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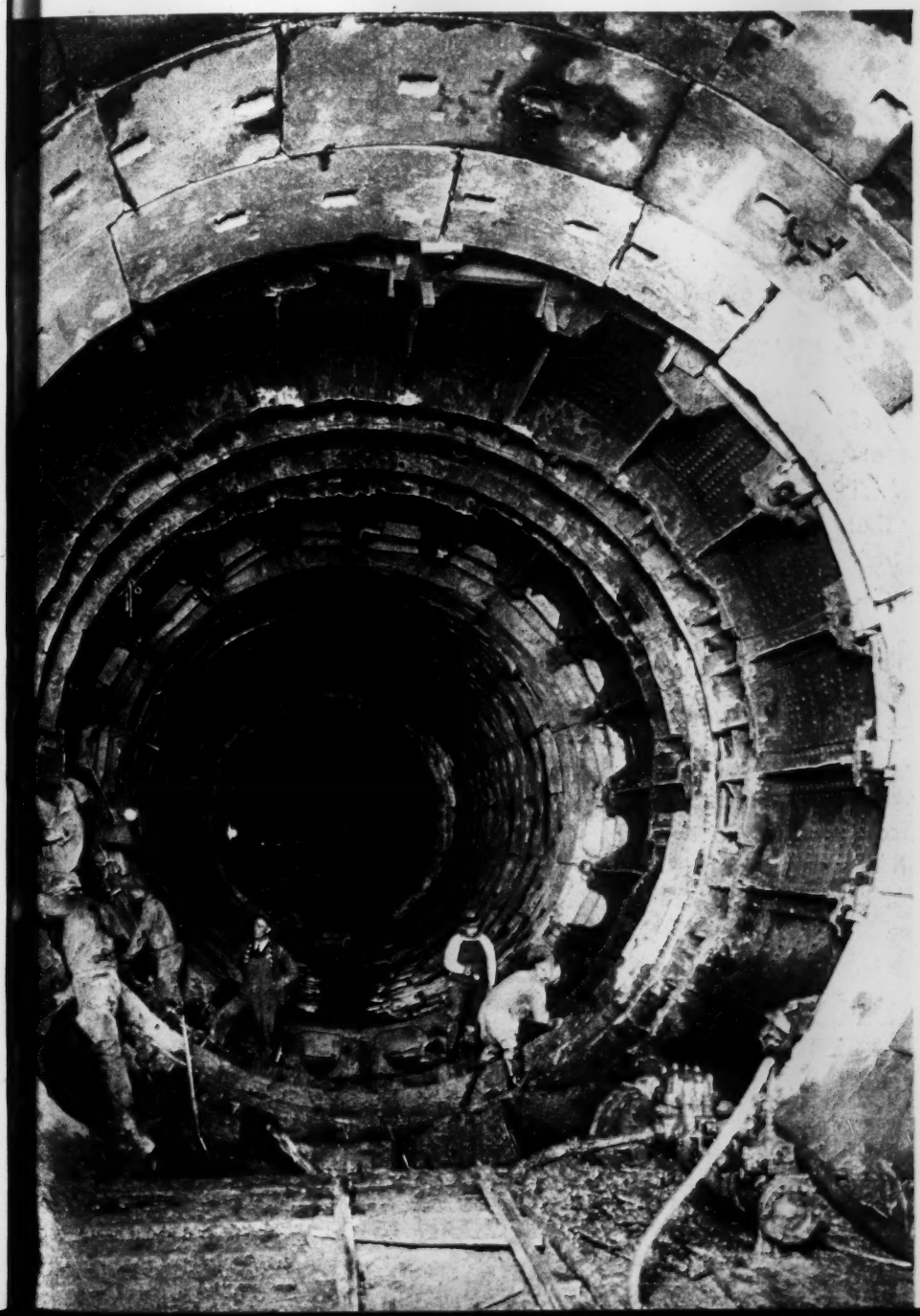


Junction of Shields in Ford Water Tunnel at Detroit

Detroit Tunnel Lined with Concrete Blocks

Mud Jack Raises Street Pavement

Frozen Concrete Used in Russian Buildings

Rapid and Accurate Mapping in Texas

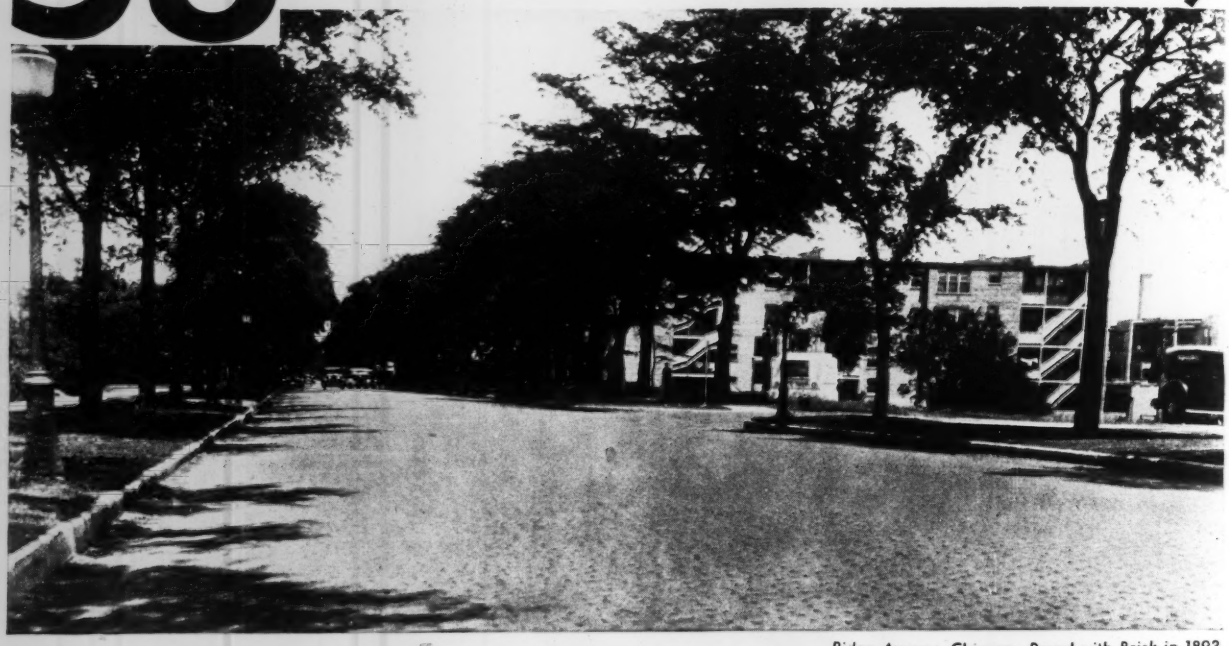
Cantilever Erection of Rigid Frame Bridge

Denver to Get New Railway Line to West

Digest of Prevailing Wage Laws

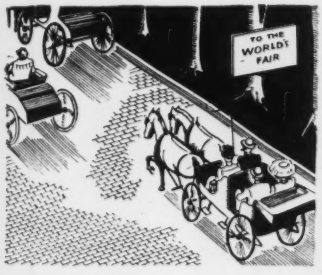
High Arch Dam for Flood Control

38 Years *On a Chicago Traffic Artery*



Ridge Avenue, Chicago—Paved with Brick in 1893.

BY 1893 Chicago was a great metropolis, the cross-roads of the continent. The glory of the World's Fair drew the attention and attendance of all America. It was that year that Ridge Avenue, north-side traffic thoroughfare, was paved—paved with brick. ♦♦ Today Chicago is preparing for another World's Fair. And the same brick laid on Ridge Avenue 38 years ago is carrying safely and smoothly the thousands of vehicles which daily pass over the avenue. ♦♦ This outstanding pavement consists of one course of second quality brick laid flatwise, covered with a sand cushion and topped by a course of brick on edge. There is no additional foundation. ♦♦ Here is



a remarkable pavement record. But it is not especially remarkable for brick. There are a great many brick surfaced pavements of the horse and buggy days still in good condition. Modern brick pavements will set far greater durability records. ♦♦ That is why a modern brick pavement . . . smooth, sightly, tested and OK'd by time . . . is the only pavement which should be considered for heavy traffic thoroughfares.

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ENGINEERING NEWS-RECORD

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Notable Tunneling

CONSTRUCTION of the condensing water tunnel described in this issue developed interesting phenomena in the behavior under pressure of the plastic clay that underlies large sections of Detroit, Mich. Tunnel construction is not a new experience in this clay; it has been bored many miles for sewer and water tunnels during the last dozen years, and methods have been developed, particularly in full-section machine boring, that are in a measure epochal. In the work described in this issue attention centers largely on the refinement in processes, which has made concrete-block lining behind shields a certain and rapid tunneling process. The dual lining of concrete blocks and a ring of monolithic concrete was the fortuitous result of a change in construction methods rather than a provision of lining design. Incidentally, it provides one of the thickest continuous concrete tunnel linings of record, and a much thicker lining than has ever before been employed in Detroit clay. The observations made of this clay under shield-driving pressure disclosed, however, a freeness of flow and an almost hydrostatic property in distributing pressure, which warn tunnel builders clearly against anything less than careful design and construction of the lining wherever such possibilities of changing earth loadings exist as in a rapidly developing city.

Frozen Concrete

DELIBERATELY forcing fresh concrete to freeze to delay the chemical action of setting until such time as setting can proceed without the risk of its being interrupted by frost, as has been done successfully in the Ukraine for some years now, is a most unique way of carrying on winter construction. Elsewhere in this issue a Russian engineer describes the winter construction method employed by him. It differs radically from methods employed elsewhere in that the concrete is mixed cold at temperatures as near freezing as possible and then is placed in thin layers exposed to the low atmospheric temperature of the region. In this way freezing takes place immediately, before the chemical action can get under way. When the entire structure is frozen it is protected against *heat*, thus keeping it frozen until mild weather sets in. Once all danger of extremely low temperatures is past the mass is permitted to thaw, and setting then takes place normally. The secret of the success of the method lies in freezing the concrete before the initial set has taken place. Obviously, such a way of handling concrete has no practicable value except in countries where winter temperatures are extremely low and constant, as in northern Russia. However, aside from its academic interest elsewhere, the success of this method may explain why some jobs in this country were not failures although the concrete was frozen. Doubtless in these instances the concrete froze in so early a stage of the setting as to duplicate the conditions deliberately created in the Russian work.

Killing the Goose

A PAUSE in motor-vehicle registration was recorded in 1930. The year's increase in vehicle ownership was less than 1 per cent. In the same time the income from gasoline taxes increased 15 per cent and the gas consumed per vehicle increased more than 3 per cent. Some of the slack in registration should doubtless be charged to business depression. Taken in connection with the increase in gasoline consumption it may also be assumed to indicate that the period of intensive motor-vehicle acquisition is closing and the period of more intensive use is beginning. As thought is now coming to be centered on use, the cost of operation is certain to be scrutinized more closely—and gasoline taxes count high in the cost of use. Where the point of diminishing returns may be in gas-tax rates is a nice problem for speculation, but such a point exists, and there is growing opinion that the 6c. rate of some of the states is close to the breaking point. If, in addition to increasing rates, legislation continues to attempt raids on motor-vehicle tax funds in order to reduce property taxes the break in income is bound to come very soon. Roadbuilding interests have here a more important issue than that of primary and secondary roads. If the public clamps down on the gasoline tax there will be little increase in money for building any class of roads.

Useful Invention

RELEVELING pavements by pumping mud underneath the settled slabs was accomplished at astonishingly low cost in the city street work at Niles Center, Ill., as is described in this issue. Previous work on Iowa state roads, on which the process was developed and has been most used, had indicated one dollar a square yard as a reasonable cost assumption. On the Niles Center operation this cost was reduced seventy-five per cent, which places the cost of grade restoration, where slab settlement occurs, at a figure that cannot be approached by any other method, including bituminous resurfacing, which heretofore has given about the lowest costs. Technically the success of pavement raising by mud injection has been praiseworthy; the slab has come up under close control and with little cracking, and resettlement due to shrinkage of the mud has been limited to small and somewhat positive amounts by adding small quantities of cement to the mud mixture. With releveling costs reduced to twenty or thirty cents a square yard, mud injection becomes a process that offers wide usefulness in pavement maintenance.

The County Engineer

FEW members of the profession are of necessity so ingenious as the county engineer. Ingenuity is often a natural result of enforced economy, and the county engineer's major task is to make a dollar go the limit. His work is largely concerned with highway and bridge matters, although every other sort of public service engineering is thrust upon him—repairing or even building the courthouse, constructing drainage systems, building flood-protection works or surveying building plots. His force is not large and generally is untrained. He must be a capable office manager and a shrewd politician, in addition to being designer, construction superintendent and maintenance supervisor, sometimes all of them in a single day. As compensation for these manifold duties he is paid a salary which is often ridiculously low. Yet, despite his difficulties, the county engineer carries on, truly exemplifying the traditional characterization of the engineer as "an ingenious man" who can "do for one dollar what any fool can do for two." We are proud to salute him for his accomplishment under what often seem to be insuperable difficulties.

Water Storage Functions

SPRING and early summer brought heavy rains well distributed over the country, which have wiped out much of the water deficiency built up last year. The runoff from these rains has been rapid, however, and will not greatly increase the dry-weather flow of streams; the latter, as brought out by the recently reported findings of the Geological Survey (*ENR*, June 4, 1931, p. 938), is controlled by the groundwater level, and it will be some time longer before the depletion of groundwater can be made up. These conditions emphasize the well-known truth that impounding reservoirs depend chiefly on floodwaters, and that their functioning is largely independent of normal streamflow. In fact, it is fair to expect that most storage reservoirs should devote part of their flood-catchment capacity to equalizing the stream below by providing makeup water to increase the dry-weather discharge. The ideal conception of storage is complete capture of floodwaters and maintenance of the largest possible mean discharge in the watercourses below. Absorption and diversion of low flows is only rarely a justifiable function of storage.

Better Airports

AIRPORT development has not been much in the public eye since 1929, but it has been going steadily forward. In large degree the progress that is now being made is of a more substantial character than that recorded during the period when long lists of new airport projects were being announced almost daily. The business depression caused the abandonment of most of the projects that had no economic justification, and it focused attention upon the importance of good construction and sound planning in those that were able to survive. Buildings are being constructed for permanence. Hard-surfaced runways are being extended as required. Drainage has received the recognition it once lacked, and a substantial part of the investment in all modern ports is being put under ground, where it will do more good than in a pretentious administration building. Budgeting of expenditures is now commonplace and has been aided by a survey of 450 ports by the Department of Commerce, which showed that land costs generally should not exceed 50 per cent and hangar costs 15 per cent of the investment. On these same ports grading accounted for 10 per cent, and hard surfacing for 4 per cent of the total cost. We are thus collecting some basic figures that should aid future planning. That this planning will be necessary is attested by the fact that about $1,000,000 in passenger fares has been collected at the Newark, N. J., airport already this year. Such activity presages steady development for air terminal facilities.

Prevailing-Wage Legislation

IN TWENTY STATES, according to the special surveys conducted by *Engineering News-Record*, legislation or executive order controls the minimum wage that shall be paid labor employed in public works construction. Wage legislation is new this year in five of the states having laws, and in the states where executive order prevails this action has been largely as of 1930 and 1931. Conclusively then it is the unemployment situation and the willingness of a minor but effective number of public works contractors to exploit this misfortune that have brought on the sudden accession of wage legislation. This conclusion is not at all vitiated by the fact that most state wage laws antedate the present depression, these previous laws having come into existence independently through a score of years from unrelated causes. The present wage-control activity is squarely the offspring of enforced idleness and the disposition of a few to make capital of it.

It is impossible for contracting to escape the charge of having compelled the present activity in wage control by law and fiat. Examples of wage cutting and disputes over cut wages exist on every hand to prove culpability. Legislatures and public works officials have had no recourse but action if a general wage debacle was to be avoided. Wage cutting by a few contractors—and in every instance a few contractors and largely contractors foreign to the locality have been the culprits—could not have persisted long without involving all contractors. This was a result to be prevented by all means, and contracting was not organized to provide any means that were effective. The lesson is very plain: in wage control, as in accident prevention and all other things affecting public and customer relations, contracting has to show ability to keep its practices clean or the task will be taken from its hands.

The immediate question is obviously: what are wage laws doing or likely to do to construction? No reason exists to assume that any considerable effect will be experienced ultimately. Construction obeys ordinarily too persistent a call to be hindered greatly by wage laws. It will adjust itself to the vagaries, obscurities, impracticabilities and general muddiness of business thinking reflected in these laws, and it will go ahead with a little more grinding of gears and friction of motion than before—but nevertheless it will go ahead. At least this has been the experience in states that have had wage laws for half a dozen to a score of years. Not strictly workable in these states, as indeed they can never be, they are made workable by human adjustments of interpretation and enforcement.

The momentary effect is of course to delay work and add difficulties to its inauguration at a time when economic and human need calls for fast and frictionless activity. Some of the instances of delay have been

recorded in these columns as they have come to attention. These are only the cases made spectacular because of the great sums or the long delay involved; there is far greater significance in the thousand and one small activities involving as many delays—of only a few days perhaps—in putting a living wage into the hands of need.

Construction should not require wage regulation by legislative and executive action. Wage laws, like lien laws and accident-prevention laws, have a reason only because construction has not shown its capacity to organize for self discipline; because it fails of adequate appreciation of its public obligations. Contracting has shown more activity in reforming its practices than have most other groups, and it is evidencing a more generous disposition of give and take than have most other groups. The recent wage-law activities are clear indication of the hard task remaining and of the need of greater unanimity of effort.

Low Construction Costs

FIGURES showing how building costs have declined in the past two years, published in last week's issue and continued in this issue, indicate in a striking way how decreased material prices, lower actual wages and the higher efficiency of labor have increased the value of the construction dollar. Not in many years has it been possible to do so much and do it so well for the same money as it is at the present time. Here is a message that the construction industry should spread abroad.

Building material prices declined steadily during the early part of the depression, but they now continue at about the level reached a year ago, indicating that little further decrease can be expected. Cement is down to bargain prices, and in most regions this has been reflected in a pronounced drop in the cost of concrete, now such an important element in most types of construction. In a few cases local factors like the monopolistic control of the sand and gravel business at New York have checked the effect. Structural steel, another important element, is down as far as is to be expected. Brick also is down considerably, except in regions remote from the centers of production.

Actual wages paid are quite generally lower than established wage scales. This fact was pointed out last week in commenting upon a recently published statement to the effect that wages in the building industry have not declined during the depression. Established scale rates have been maintained, as is desirable in order to avoid labor troubles when the upturn begins; but labor, like everything else, has adjusted itself to present conditions. The extent to which such voluntary wage reductions have been accepted is difficult to determine because they are not subject to general agreements like wage scales. However, a careful survey that we conducted recently showed that actual wages paid ironworkers, plasterers, bricklayers and carpenters are down from 17 to 20 per cent, in the order given, and that the actual wages of common laborers are down 26 per cent.

Finally, the factor of labor productivity enters into the situation to a degree not fully appreciated. For the mechanic and laborer it cuts down his effective wages while there is not work enough to keep him employed constantly. For the builder it materially affects the cost of his structure. Here again it is difficult to be specific, but estimates obtained from contractors in widely scattered regions and presented elsewhere in this issue indicate a man-hour output of as high as 125 per cent of the output in 1926 for the South and Central West and lesser amounts for the Eastern states.

The construction industry needs to shout these facts from the housetops. There still is a very general impression abroad to the effect that the industry has not adjusted itself to changed conditions. Financial men appear to believe that the industry will not have reached rock bottom until wage rates have been cut. Pronouncements such as that of the National Industrial Conference Board, commented upon in these pages last week, serve to support financial men in their belief. These men say that capital has had its wages cut and that labor must expect the same medicine. They fail to see that working for wages below the authorized scale or working only part of the time has cut labor's wages just as effectively as a cut in the scale.

The construction industry must offset this impression; it must hammer home the fact that it has adjusted its cost downward materially. Until this fact is impressed upon those who hold the pursestrings the industry can expect little improvement.

Half a Loaf

DENVER is to get half a loaf in the Dotsero cutoff. Where the city had hoped originally to have a through main line to Salt Lake City, over which transcontinental freight and passenger traffic would move, it now gets a less direct line, over which it is doubtful whether much local traffic will find its way. The Moffat Road, begun so hopefully more than a quarter of a century ago, with pioneering spirit built a temporary steep and circuitous line over the continental divide, but later found itself unable to finance a low-level tunnel through the divide, and finally stopped construction at Craig, Colo. —far short of its original destination on Salt Lake. In recent years the tunnel was built by public financing and at great cost. But without dense traffic it has turned out to be a liability. It came too late. The pioneering spirit that would have pushed the railway line through to Salt Lake City in the early part of the century was largely gone, and what was left had cold water thrown upon it by examiners for the Interstate Commerce Commission, who reported that they could find no justification for completing the Denver & Salt Lake Railroad (Moffat Road) by extending it to Salt Lake City for Pacific Coast connections.

Control of the present dead-end railway line now passes to the Denver & Rio Grande Western, under a condition imposed by the Interstate Commerce Commission that it build a connection between its line and the Moffat Road at a point where the two roads come within about 42 miles of each other to the southwest of Denver and just west of the tunnel. This connection is locally known as the Dotsero cutoff. It will give Denver a more direct outlet to the West, but it is doubtful whether it will bring much through traffic to Denver. The Denver & Rio Grande Western is owned jointly by the Western Pacific, with which it connects at Salt Lake City, and by the Missouri Pacific, with which it connects at Pueblo, 120 miles south of Denver. Through traffic between these latter roads finds its most direct route over the existing line of the Denver & Rio Grande Western from Pueblo; and to route it through Denver and the Moffat Tunnel would be to loop it far out of its course. Further, the prospect for much traffic from other lines is not bright. The Moffat Tunnel appears to be a fallen star, its brief period of brilliancy ended.

Concrete Block Lining Permits Rapid Driving of Large Water Tunnel in Detroit

Fig. 1—Start of concrete-block lining, Ford water tunnel, Detroit
A section of timber cants, which failed to withstand the necessary jack pressures to shove the shield forward, is shown in the foreground. Failure of the timber cants required a change to concrete block lining.

Precast blocks successfully used on shield-driven water-intake bore at Ford plant after timber cant lining fails to withstand pressure of shield jacks—Tunnel has capacity of nearly one billion gallons daily

A STEADY average progress of 20 ft. per heading each ten-hour shift was maintained in driving with shields a 21-ft. concrete-block-lined water tunnel, 12,000 ft. long, between the River Rouge and the Ford Motor Co.'s Dearborn plant in Detroit. The tunnel is 15 ft. inside diameter and has an inner lining of 18 in. of monolithic concrete inside an 18-in. concrete-block lining. The bore has a capacity of 913.6 m.g.d., amounting annually to 333,464 m.g. more than the yearly requirements of Detroit, Cincinnati, Washington and Philadelphia combined. It was built to provide an additional supply of cooling water for the condensers of the main power plant, and it is one of four major improvements recently made at the plant. Others include the installation of two new high-pressure boiler units and a new steeple-type turbine generator and the introduction of turbo-blowers of increased capacity.

The new tunnel takes off from the River Rouge at the foot of Dearborn Ave. (Fig. 2), runs under the avenue to Miller Rd., and then to the Ford plant. For almost its entire distance it is directly under the streets, passing under several railroad tracks and a small creek. The old tunnel had its intake at the plant, a short distance upstream from the outlet tunnel. As the stream is very sluggish, the water was being re-used before it had a chance to cool sufficiently. With the new installation the cooling water will be taken in at a point near the mouth of the river and then discharged at the plant, passing out to the Detroit River through a short-cut ship canal.

The original plans called for a shield-driven tunnel of 15-ft. inner diameter, with 8x8-in. segmental timber cant lining for the shield jacks to shove against, followed by a 25½-in. lining of monolithic concrete. The tunnel was driven from two shafts, 12x16 ft. in plan, sunk at locations shown in Fig. 2—one 63 ft. and the other 68 ft. deep. The shafts were sheeted with steel sheetpiling and steel wales. They divide the tunnel into four nearly equal lengths, which were driven by four shields, two working both ways from each shaft.

The tunnel was driven through soft clay requiring bulkheads in the shields to prevent the plastic clay headings, carrying an overload of 6,000 lb. per sq.ft., from flowing into the tunnel. When the first shield started tunneling at shaft No. 1, it was found necessary to have twelve 12x12-in. openings in the bulkhead because of the limited resistance that the wooden cants afforded against the shield jack pressures. As a result, more clay came into the tunnel than its size required, so that a settlement of 2½ ft. occurred in the street above. After the tunnel had been driven about 100 ft., the work was shut down.

The difficulty was overcome by the adoption of interlocking precast concrete-block lining, each ring made up of nine full blocks and two half or key blocks. The modified plans called for a tunnel of 21-ft. outside diam-

eter. This size was adopted to fit the 21-ft. 1½-in. inner diameter of the tail of the shields. The maximum compression stresses in the 18-in. thick blocks, due to the overhead loads, were less than 500 lb. per sq.in. On this basis the block lining was amply strong to carry the external loads. Inside the lining an 18-in. monolithic concrete lining was added, making a finished bore of 15-ft. inside diameter. In part of the tunnel underlying railroad tracks, 1-in. reinforcing bars on 12-in. centers were placed circumferentially in the inner lining.

Through an agreement with the city of Detroit original plans for the tunnel project contemplated furnishing water in the future to various industries that might locate in near-by areas. Calculations show that had the block lining alone been used, the tunnel would have had a carrying capacity of almost double that of a 15-ft. bore.

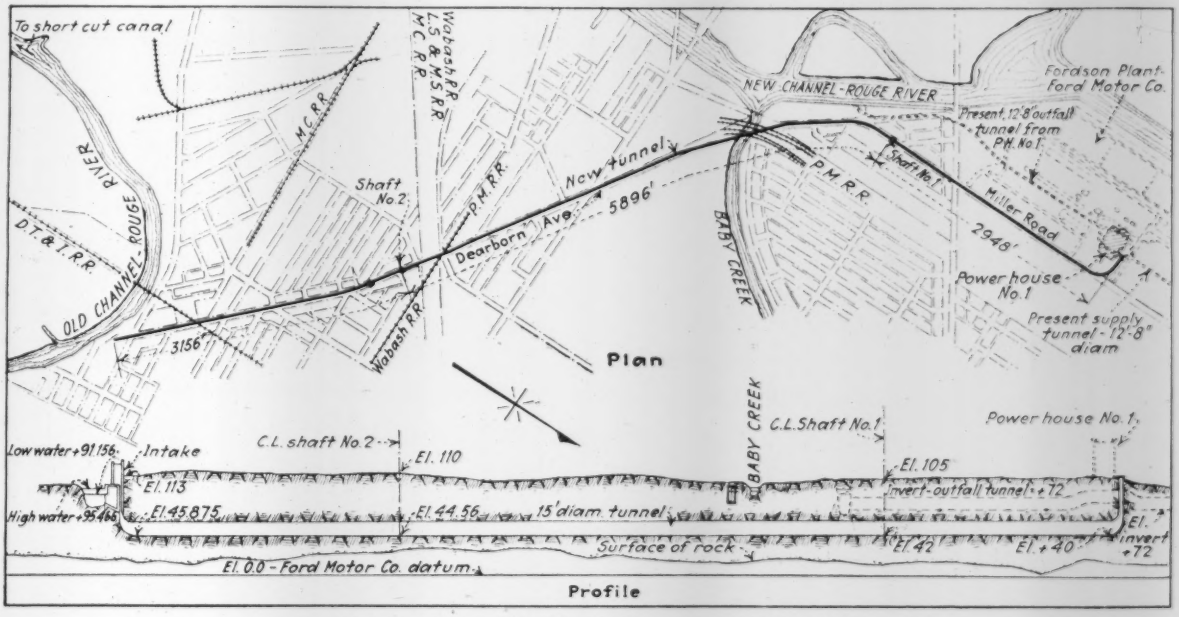


Fig. 2—Map and profile, Ford water tunnel, Detroit

Twenty 10-in. hydraulic jacks were used in driving the shield. An average shoving pressure of 3,600 lb. per sq.in. in the twenty jacks exerted a pressure of approximately 8 tons per sq.ft. on 363 sq.ft. of shield face. An unusual opportunity was afforded for observing the phenomenon of distribution of pressures through clay, and the flow of clay under pressure into spaces around the lining in shoving the shields. Anticipating the need of gravel packing to fill in the annular space left at the tail of the shield, holes were cast through alternate blocks for the introduction of gravel packing to this space. However, it was found that enough clay was being squeezed into the space around the tunnel at the tail of the shield during shoving to fill this annular void, eliminating the need of gravel packing. That the void behind the tail of the shield was completely filled by clay from the heading was indicated by the fact that no settlement of tunnel or of streets was found after the use of concrete blocks commenced. Careful levels taken after each shove showed that the paving and street grades were raised from ¼ to 1 in. by the passage of the shield below.

A curious result of the action of the clay under pressure was the pushing out of some of the tightly driven wooden plugs in the 1½-in. holes for gravel packing in rings some distance behind the tail of the shield. These plugs were pushed out of holes situated all around the inner circumference of the lining, showing that much of the 8 tons per sq-ft. pressure on the face of the shield during a shove was carried back through the plastic clay surrounding the tunnel, acting equally in all directions, similar to hydrostatic pressure. This pressure resulted in stresses in the tunnel lining during shoves about two

But the original size was adhered to, and the inner lining was placed to bring the tunnel down to 15-ft. inside diameter.

Tunnel Driving

The invert of the tunnel lies from 65 to 70 ft. below street surface. For most of its length the bore is in a squeezing blue clay with occasional gravel pockets, though some sand was encountered on the Miller Road end of the job. For both sinking the shafts and handling tunnel muck and materials a steam crane on crawler treads was used at each shaft, instead of the usual head frames and elevators. Muck was loaded into skips on flat cars hauled to the shafts by storage-battery locomotives. At the shafts the skips were hoisted by a crane and dumped into elevated bins at the rate of one hoist per minute. The bins dumped into trucks for final disposal of the muck. All the bins were portable and were equipped with lifting eyes, so that a traveling crane could handle them from one part of a job to another or from job to job.

Two narrow-gage tracks were used in the tunnel leading into each heading, one track for empty cars and the other for loads. The tracks rested on long 8x8-in. ties, with the ends tapered to bear on the tunnel lining, placed skin-tight as the track was laid. Later, alternate ties were removed and the openings boarded over to form a solid floor, keeping the invert clean and free from trash. A double cross-over switch was maintained close to the shield and was moved forward, together with the erector platform, after each shove. The procedure was to set in nineteen empty skips on cars next to the heading to handle all the muck from one shove and to move the cars to and from the heading by hand.

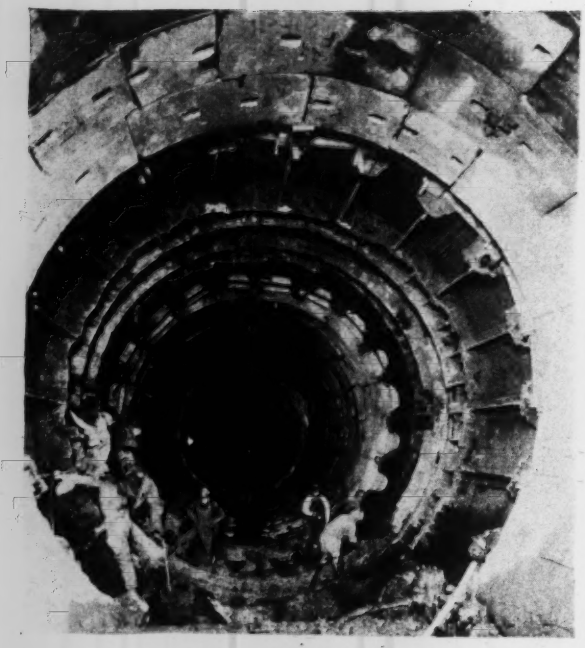


Fig. 3—Junction of two shields after jacks and platform had been removed and diaphragm burned away

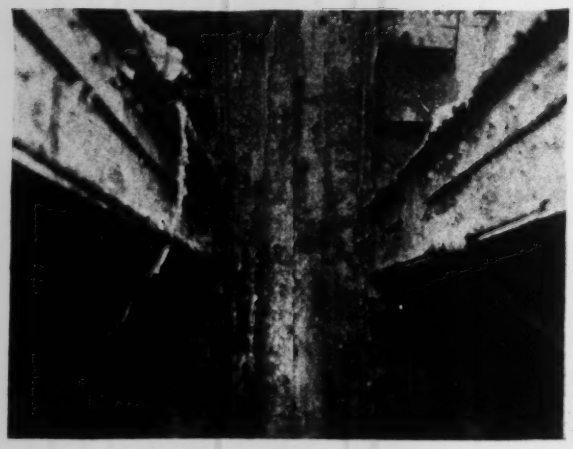


Fig. 4—Perfect junction of cutting edges of two shields that started 3,200 ft. apart

and a half times greater than those due to the weight of the overlying ground. Another interesting fact is that although the clay was forced into the 1½-in. gravel holes with sufficient pressure to push out some of the wooden plugs, the clay arched over the ¼-in. open joints between the blocks. Despite the high pressure exerted radially on the tunnel during the shoves, the concrete-block lining shows no distortion in the horizontal or vertical diameters of the rings.

Two ten-hour shifts per day were used in all headings. The high speed in driving was due in part to the favorable character of the ground for shield tunneling, and to well-organized and efficient tunnel crews, who were paid not on an hourly basis, but at the rate of two hours' pay for each advance of one 30-in. ring of blocks. Each shift had to keep tracks and flooring up to the heading at all times and clean up after every shove. Under this arrangement a steady progress of eight rings, or 20 ft. of tunnel, was made per shift, with the work actually completed most of the time between eight and nine hours. Occasionally a ninth ring was placed by a crew within ten hours, and toward the end even greater progress was made by some of the shifts.

Four 12x12-in. openings were used in the bulkheads of each shield, through which clay was forced in continuous prisms during a slow shove. Two men worked at each opening, one with a wire loop to cut the prism into 6-in. lengths, while the other threw the chunks as fast as cut into a muck car. The excavation per ring was 32 cu.yd., which filled nineteen skips of 2-cu.yd. capacity. Each of the four openings in the bulkhead admitted 8 cu.yd., or 216 lin.ft., of prism during a shove. As 45 minutes was usually required for a shove, the speed of the prisms through the bulkhead was about 5 ft. per minute. In some places where real soft ground was encountered the number of openings was reduced to three.

Less than two minutes was required to load a skip. The shoving of shield was stopped while shifting cars, the movement of the prisms slowing down instantly as the pressure was relieved. After a shove was completed, 3 or 4 ft. of clay came through and hung down from the openings without breaking off, indicating the consistency of the material. As soon as the last car of muck left the heading, the first concrete block of the ring was brought forward and lifted up from the car by an air hoist mounted on the under side of the erector platform. While the erector was setting the block, another block was brought forward and lowered ready for the erector, blocks being set in the ring as fast as the erector could pick them up and put them in position.

The blocks were placed by a hydraulic-operated erector arm mounted on an independent carriage. The blocks above spring line were held temporarily in place until the rings were completed by eight longitudinal I-beams mounted on screw jacks in two semicircular ribs, shown in Fig. 5. These bars were moved radially by the screw jacks and longitudinally by hand. Two corrugated steel shims were placed in the joint between the blocks as they were erected in the ring. The shims accurately spaced the blocks in the ring, and at the same time afforded a cushion to save them from injury by the slight

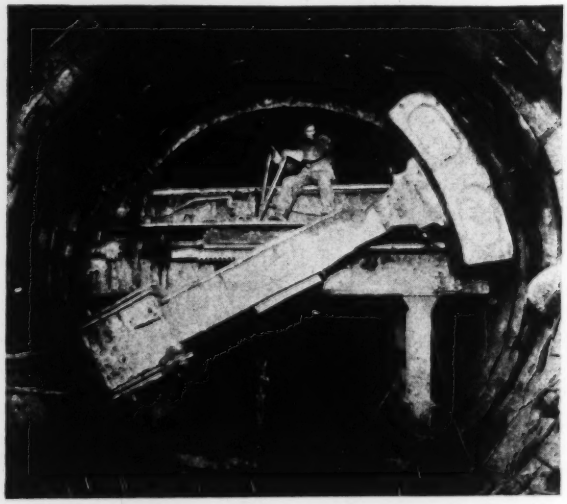


Fig. 5—Front view of hydraulic erector mounted on independent carriage

Erector has been moved out into completed portion of tunnel to obtain this view. In actual operation erector works within the tail of the shield.

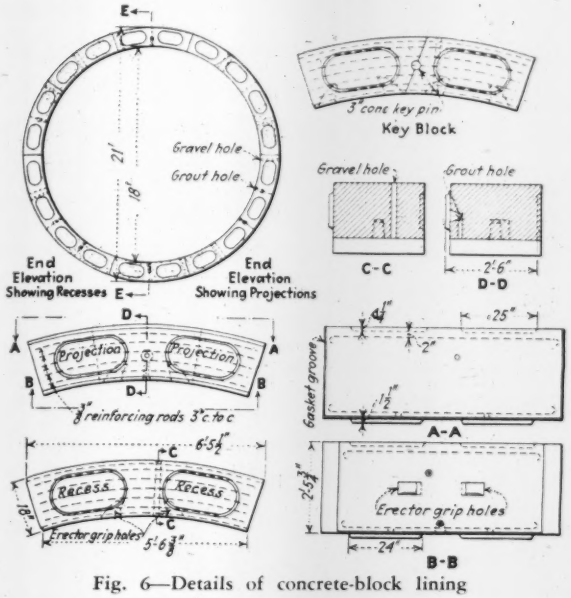


Fig. 6—Details of concrete-block lining

but unavoidable concussion in placing. This fact was proved by a test using solid steel bars for shims, which resulted in the spawling of the concrete. The blocks weigh about 2 tons each and swing on the end of a 9-ft. erector arm in which some sway was unavoidable, a slight blow on the shims always accompanying the landing of a block in place. The corrugated shims are an important advance in concrete-block tunnel construction, for they not only protect the blocks while being set, but their uniformity insures accurate diameters. Furthermore, they give the ring, when closed, immediate arch strength. They also permit free flow of grout through the longitudinal joints from ring to ring. For this reason it is essential that the radical joints of about every fourth ring be pointed to confine the grout to short lengths of tunnel and prevent it from flowing forward into the shield. The tunnel can then be grouted to refusal under about 100 lb. per sq.in. pressure.

The blocks were placed in the ring with the recessed faces towards the shield. Oak pads took the thrust of the jacks and distributed it evenly over the bottom of the recesses, providing an effective cushion.

Remarkable alignment and grade were maintained in driving all four shields. Along part of the route, alignment holes were drilled from the surface every 1,000 ft. Two of the shields, starting 3,200 ft. apart, met in perfect alignment and grade without the aid of alignment checks through holes from the surface. Two views of the junction of these shields are shown in Figs. 3 and 4.

Design of Blocks

The blocks, except for the key sections, are very similar in design to those used in the shield-driven subway tunnels in a Brooklyn section of New York subways, described in *Engineering News-Record*, Nov. 20, 1930, p. 796. The standard block is 6 ft. 5½ in. long on chord of outside arc, 18 in. thick and 30 in. wide. On the ring faces each block has two lugs 1½ in. high on one side, and two recesses 1¼ in. deep on the other, which provide a ¼-in. joint between the rings. Corresponding lugs and recesses of adjoining rings fit loosely together, being so spaced that the blocks break longitudinally. The jack thrusts bear against continuous lines of lugs and recesses. Each block contains two mats of five ⅜-in. reinforcing bars placed close to the faces of the circumferential joints. Two erector grip holes are on the inside face, and in one-third of the blocks are grout holes leading from the inside face into the ring joint. Holes for the ejection of gravel packing outside the lining were cast in about half the blocks until it was learned that the gravel packing was not required. Fig. 6 shows details of the blocks.

One complete ring of lining consists of nine equal-size blocks and two half-blocks, the two latter equaling one full block in length. The ring joint between the two half-blocks is so arranged that the second half-block can be slipped radially into its position as a key block. Short lengths of 3-in. concrete pins placed loosely from the front side of the ring into a hole molded in the joint between the half-blocks keyed them in place. Curve alignment was taken care of by taper rings of successive tapering blocks narrowing a total of ¾ in., 1⅜ in. or 2¾ in. Using these three different degrees of taper rings in combination with standard rings gave any desired curvature of tunnel. The new two-part key block has been found more satisfactory than the old method of

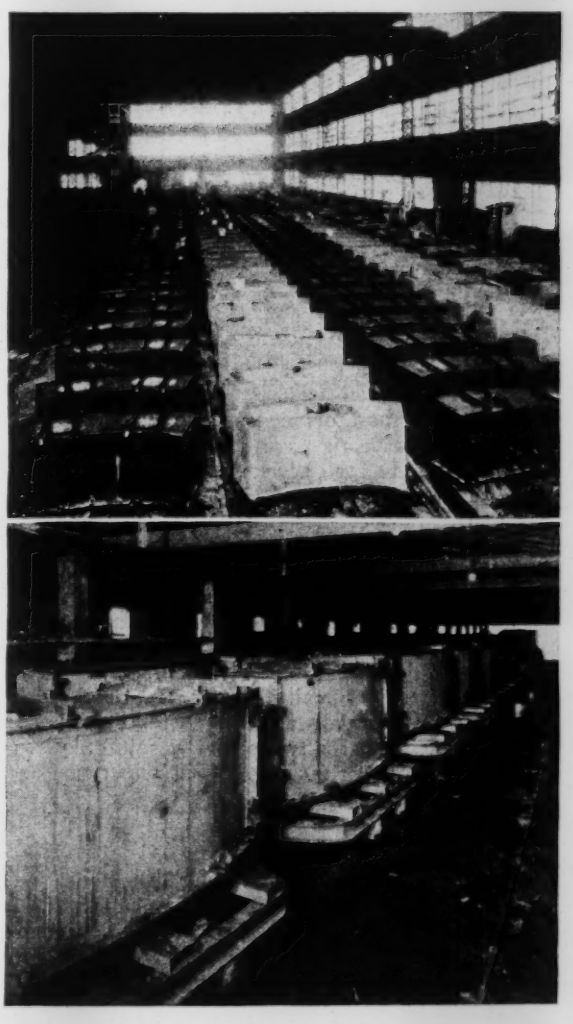


Fig. 7—Two block-making plants

Above, old machine shop is utilized for casting shed. The concrete is poured from traveling paver carrying power hoist, as shown in left background. Overhead crane transfers completed blocks to cars for handling to storage yard. Below, at plant No. 2 block forms are mounted on individual cars and are filled from central plant.

having a full-length key block with two full-length special blocks adjoining, and has contributed to facility in erecting the rings. Altogether the 15 min. or less required for erection of one ring is about half the time heretofore required on similar work.

Block Manufacture

Blocks were made at two plants, using different pouring methods at each. Steel forms were used in both cases. At plant No. 1 the forms were set on the floor of an old machine shop on five rows of longitudinal stringers, as shown in Fig. 7. A full set of bottom form panels remained on the stringers, but as a day's pour filled alternate rows and half the fifth row of forms, and the night shift removed the sides, set them up on the adjoining row of empty bottoms and filled them, only

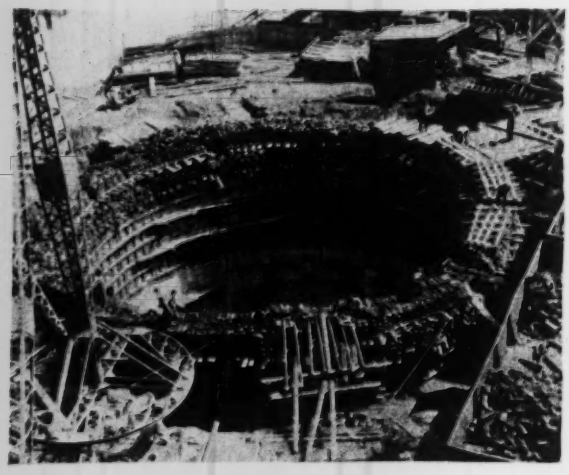


Fig. 8—Test load of 1,200 tons of pig iron on the pump-well caisson

listed above. A more detailed statement for 1925 gave poured from a traveling paving mixer carrying a hoist tower with a chute for delivery. An existing overhead traveling crane was utilized for loading the finished blocks onto cars for transportation to the storage pile outside the shop.

At plant No. 2 another method of pouring was used. Forms were mounted on narrow-gage cars and filled at a central mixing plant. After filling, the cars were run into a shed where the blocks remained until forms were stripped and set up again on an adjacent string of cars. Bottom form panels remained on the cars at all times. A total of 45,790 blocks was required for the job. The combined capacity of the two plants was 400 blocks per day, which is equal to 40 rings 2½ ft. wide, or 100 ft. of tunnel.

Inner Lining

The 18-in. thick inner lining in the tunnel is of monolithic concrete throughout. A speed of 51 ft. per day in straight tunnel and 40 ft. per day on curves was maintained by each of the lining crews. The forms were filled to the spring line by gravity from cars pulled up an incline by an air hoist. The upper forms were filled by hand shoveling. At 10-ft. spacing grout pipes were placed on the arch. A total of 33,560 cu.yd. of concrete was required for the inner lining. A concrete testing 2,650 lb. per sq.in. in 28 days was specified for the invert of the tunnel, and a 4,000-lb. concrete was required for the crown. The concrete was mixed at the top of the shaft and chuted down to cars at the bottom.

Intake and Pump Well

More than 1,400 piles were driven as supports for the intake and screen-house structure. The intake unit, including a screen-house structure 44x140 ft., covers an area 54x174 ft. A basin 370x180 ft. was dredged to a depth of 35 ft. along each side of the intake structure. The intake is fully provided with screens, gates and stop logs, and is served by a 10-ton overhead electric crane.

The pump well, located immediately adjacent to No. 1 power house, was sunk by the open-caisson method about 65 ft. deep. It is 17 ft. in outside diameter. The walls are 4 ft. thick. The initial ring, 20 ft. in depth, was provided with a cutting edge. Walls were built up in 5-ft. lifts, sufficient to sink the caisson of its own weight. Hardpan was reached at a depth of 80 ft. To test the bearing of this hardpan, 1,200 tons of pig iron (Fig. 8) was piled on top of the caisson without any further sinking occurring.

A circular tunnel, 15 ft. inside diameter and 160 ft. long, all on a curve, was driven under air between the pump well and the main supply tunnel. Another 15-ft. tunnel was driven 158 ft. between the pump well and a surge chamber. Four booster pumps of the vertical propeller type, each having a capacity of 157,750 gal. per minute against a 14.5 ft. head, have been placed in the pump well.

Contractors and Personnel

Frank Riecks, assistant engineer, power and construction department, and William Vardon, resident engineer, supervised the work for the Ford Motor Co. S. A. Healy, Detroit, was the contractor. Rights for the use of the block design and methods of erection were secured from John F. O'Rourke, New York.

The World's Railways

A total route length of 776,834 miles of railways in the world is given by the Bureau of Railway Economics, based upon figures for the end of 1927 as published by the *Archiv fur Eisenbahnwesens* in 1930. Of the total, 250,026 miles were in the United States (including Alaska), and the statement points out that with less than 8 per cent of the world's area and less than 7 per cent of its population, this country has 32 per cent of the railway mileage. A score of the principal countries are listed below. A more detailed statement for 1925 gave totals of 316,644 miles for North and Central America (United States, 250,900); Europe, 238,807; Asia, 84,252; South America, 56,410; Africa, 37,481; and Australia, 30,110, or a world's total of 763,764 miles.

United States (including Alaska)	250,026	Brazil	19,603
Russia	47,762	Mexico	16,443
Canada	42,626	Japan	14,935
India	38,822	Italy	13,049
Germany	36,299	South Africa	12,135
France	33,281	Poland	12,066
Australia (including New Zealand)	30,777	Sweden	10,110
Great Britain (including Ireland)	24,396	Spain	9,859
Argentina	23,482	Czechoslovakia	8,553
		China	8,426
		Roumania	7,424
		Belgium	6,893

Frozen Concrete Used in Russian Buildings

Winter concrete allowed to freeze before setting—Thawing and setting then occur in the spring

By A. M. GUNZBURG
Engineer, Kharkov, U.S.S.R.

CONCRETING during severe winter weather in the open air, with the purpose of forcing the concrete to freeze before setting begins, has been carried on in Russia under special methods devised by the author, who states that since 1905 he has used these methods in the Ukraine for many large concrete and reinforced buildings, which have all proved satisfactory. Concrete placed in this manner is protected to keep it in a frozen condition until spring. A description of the method is presented herewith not with any idea that it will find application in this country but rather as information for those interested in methods of controlling the setting time of concrete —EDITOR.

AT THE MOMENT before actual setting of concrete the cement grains are enveloped in a thin molecular film of water and the greater the proportion of water in the mix the lower will be the strength of the concrete. If cold water is used, the volume will be less than with heated water, but the strength will be greater. If the concrete freezes while setting, it will become a rigid non-elastic mass consisting of sand, cement and ice particles, and such a mass will fail after thawing. But by allowing the concrete to freeze before setting it will be in normal condition after thawing, so that setting can then begin and proceed to completion.

As the concreting must be done rapidly, the forms must not be deep and the reinforcing bars must be so arranged that the concrete will flow freely and fill the forms quickly without voids. It is absolutely necessary for the concrete to freeze before setting begins. The cement is cold, the aggregate must be cold and dry and the water must have a temperature of 40 to 50 deg. F. The less water there is, the better the concrete. The concrete is mixed in a sheltered location and is placed quickly in thin layers, each layer being thoroughly but rapidly tamped so that there will be no separation, or frost plane, between the layers, the fundamental requirement being continuous placing and complete freezing of the entire mass.

As soon as the placing is completed the form is covered with boards. Concrete slabs are covered with sand or straw, over which water is poured and allowed to freeze, to prevent any thawing and consequent setting action in the concrete. When it is necessary to stop work before completion, before starting again, warm water is to be poured over the frozen surface, which is then scraped and roughened before the new concrete is placed.

The most difficult and most important operation is the wetting of concrete in the spring while thawing, as the very dry northern winds in the Ukraine during winter can evaporate moisture even from the frozen concrete. Thus it will be so dry that it cannot set and it is necessary to apply water, but the water must be applied very carefully in order not to wash out the cement. While watering is being done, a careful workman below must order the watering stopped immediately on the first appearance of water on the bottom of the form. For beams and columns, a form board is removed, water is applied, the board is replaced, and then other boards are removed and replaced in succession. For massive parts, special openings in the forms may be provided for applying water daily, the concrete setting under the influence of the absorbed water and the warm weather. In thick walls, pockets may be formed, to be filled with water, which will percolate through the entire thickness of the wall.

Winter concreting by methods that employ the heating of materials and keeping the concrete warm so that it will set properly have the disadvantage of giving too high a temperature for proper setting, with the result that the concrete does not attain its full strength. Although the freezing method ties up the formwork for a considerable time, this objection is slight in comparison with the advantages of getting the concrete placed during the severe winter. The freezing method is not employed near the end of the cold season when alternate spells of cold and warm weather may be expected.

Mud Jack Raises Street Pavement for 25c. a Yard

Peak pressure required to break slab loose from subgrade—Loam best material for mud mixture —Raising from several holes reduces cracking

By WILLIAM E. BARKER
Chicago, Ill.

THE mud jack developed in Iowa for raising concrete road slabs, as described in *Engineering News-Record*, Dec. 18, 1930, p. 979, has been recently used for raising about 9,000 sq.yd. of street pavement in Niles Center, Ill., with results that considerably extend information about the process. The process, as previously described, consists in pumping liquid mud under the pavement through drilled holes until the slab is forced up the required distance. The apparatus shown by the accompanying illustration consists of a two-cylinder pump and a mixing chamber in which a long screw mixes earth, water and cement to form mud.

In Niles Center the holes were spaced 12 ft. apart, roughly in two lines 3 and 7 ft. from the center line of the pavement. The holes were 2½ in. in diameter and were drilled with a pneumatic jackhammer at a contract price of 40c. per hole. From 1 to 1½ minutes was required to drill a hole in the 7-in. slab.

A 3-in. 400-lb. pressure hose carried the mud from the discharge end of the pump to the holes in the slab. The hose was fitted with a metal elbow and a nozzle made of a 2½-in. rubber hose about 8 in. long. The rubber hose nozzle was pushed into the hole in the slab, and the pressure of the mud expanded it and aided in keeping it in the hole. Sometimes considerable pressure was required to start a slab, and then one or two men had to stand on the elbow to keep the nozzle in the hole. Occasionally the weight of three men would not keep the nozzle from being forced from the hole by the great back pressure of the mud. Then it was necessary to start the slab from a near-by hole. A 200-lb. pressure hose, used at the beginning of the job, burst with the pressure used in breaking a slab loose from the subgrade.

Mud jack raises slabs by forcing mud under them

It consists of a chamber where the mud is mixed, a pump and a pressure hose and is powered with a gasoline engine

Earth was hauled from a near-by lot by two trucks. Loam proved the best material. Clay and sandy soil were unsatisfactory. Loam containing some clay could be used but had to be mixed longer. Water was taken from a hydrant. Two sacks of cement were scattered in with the earth as it was loaded into the trucks, making about 1 cu.ft. of cement per cubic yard of earth.

Slabs were lifted when they had settled ¼ in. or more. For small lifts thin mud was best. For higher lifts thicker mud worked better.

The crew consisted of ten men, of whom two were truck drivers and one was foreman. Two men loaded the trucks, leaving five men and a foreman at the machine. Two of these inserted and removed the hose nozzle, one operated the engine and regulated the pressure, and one cleaned spilled mud from the pavement. The truck drivers fed the earth into the mixing chamber.

The work in Niles Center was divided into two sections. The first of these was East Prairie Road. There the pavement had been built over an old macadam roadway. The macadam had not been in the center of the street, and some of the pavement laid on virgin soil had settled. This settlement was all on the east side of the center joint. The settled slabs were raised an average of 1½ in. and a maximum of 2¾ in. Calculating the area raised as all the pavement between center joint and curb, a total of 4,722 sq.yd. of slab was lifted at a total cost of $1,268.58, or at 27c. per square yard.

The remainder of the slabs raised were in scattered locations on several streets. A total of 4,175 sq.yd. was lifted a minimum of ¼ in., a maximum of 2 in. and an average of 1 in. for a total cost of $905.63, or at the rate of 22c. per square yard.

Only one or two cracks formed as the slabs were raised, due to raising too much from one hole. When slabs are to be lifted more than an inch, the hose is shifted from hole to hole, raising a little from each, so the slab will not be bent too much.

If there is any chance that further settlement will occur, it is wise to fill the holes drilled in the slab with bitumen, so that they can be dug out easily when the slab is to be raised again. Otherwise they are filled with concrete of low water-cement ratio. The experience in Niles Center indicates that it is difficult to measure accurately the area of slab actually raised because the line between the portion of the slab that was raised and that which was not is so indefinite. It is suggested that contracts for such work be let on a per diem basis, or per cubic yard of material forced under the slab, as measured by the earth put into the machine.

Long Rigid-Frame Bridge Erected by Cantilever Method

By ROLF SCHJODT
Civil Engineer, Rio de Janeiro, Brazil

THE Herval bridge in Sta. Catharina, Brazil, involves a number of unusual features. In general design it is a continuous reinforced concrete frame, with a main span of 224 ft., the longest yet built. In addition it was erected as a cantilever, without falsework. The bridge spans the Rio do Peixe, in southern Brazil and forms a much-needed connection between the railroad and the town of Herval on one side and the cattle-producing districts on the other side of the river.

Owing to the absence of lakes and the heavy rain-

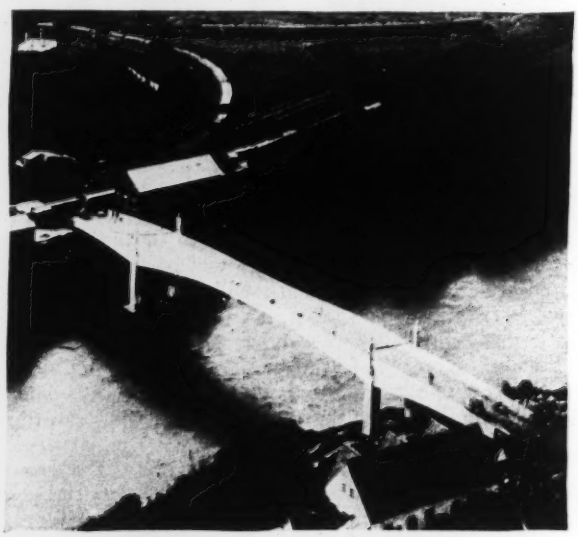


Fig. 1—Rigid-frame bridge in Brazil with a center span of 224 ft.

This is the longest bridge of this design yet built and displays the slender proportions characteristic of its type.

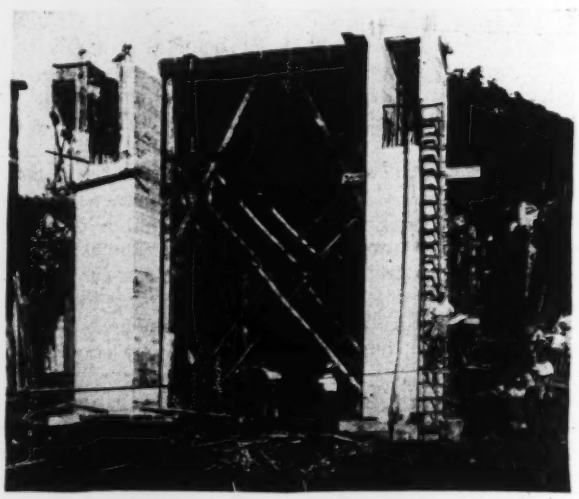


Fig. 2—Main piers were built as forked columns with girders carried on pin bearings during the construction stage to eliminate bending in the columns

On completion of construction the bearings were embedded in concrete, converting the structure into a continuous rigid frame.

falls in the coastal mountains, the river is subject to sudden floods at all times of the year. The water level occasionally rises 35 ft. and more during a night. This condition, together with the expensive transport of materials to the site and the cheap local labor, constituted the reasons for the design chosen.

The bridge has a useful width of 25 ft., including two sidewalks of 3.5 ft. each. It was calculated for heavy traffic. There are two shore spans, of 76 and 86 ft. respectively, and one river span of 224 ft. The thickness of the ribs at the crown is one-fortieth of the span. The foundations under the main columns were carried to rock. The columns are forked on top to permit the passage of the beams, each of which rested on two cast-iron bearings during the construction operation. Later they were embedded in concrete, the

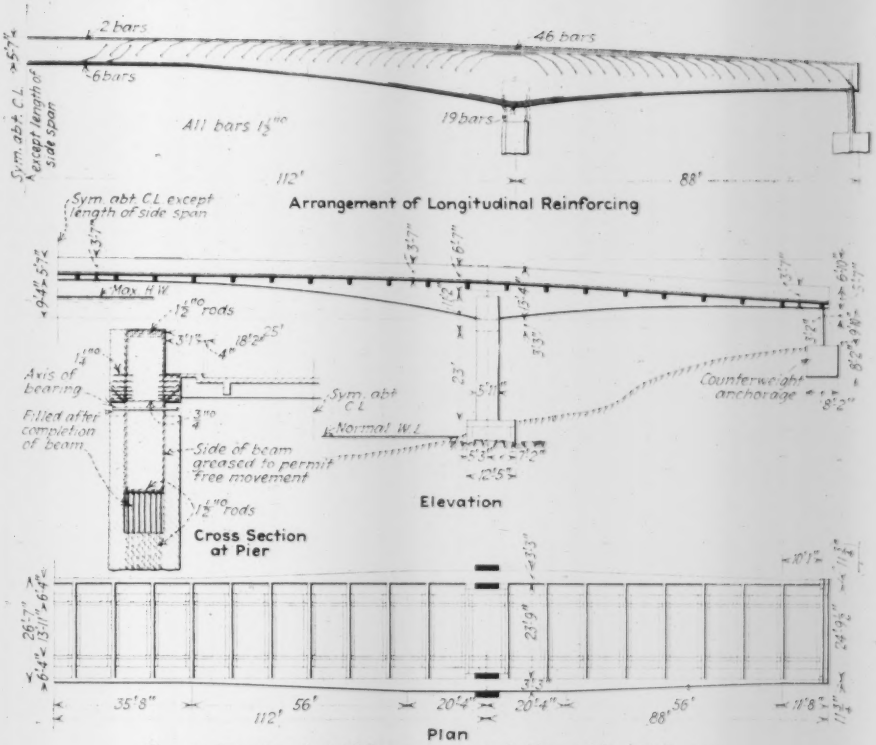


Fig. 3—Details of rigid-frame concrete bridge with 224-ft. span

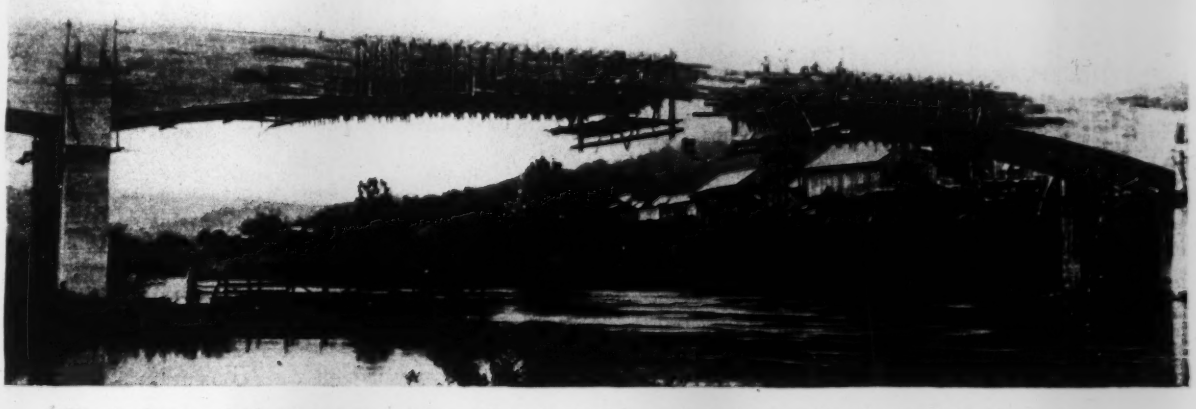


Fig. 4—Concrete bridge being erected by cantilevering in 5-ft. sections, the form boards supplying the support

whole structure then working as a continuous frame. This method was chosen to eliminate excessive bending moments in the columns. The shore ends of the beams are anchored to counterweights of concrete and stones.

The shore spans and the first 30 ft. on both sides of the river span were erected with falsework. The remainder of the river span was cantilevered in 5-ft. sections. The form boards were 15 ft. long, each reaching one section farther than the board immediately below. Thus for each new 5-ft. section two-thirds of the boards were already in position and secured by the previously poured concrete. The remaining boards were then placed, and the whole was braced by vertical wooden members. In this way the forms themselves carried the fresh concrete.

The reinforcement consisted of 1½-in. round iron bars, in 5-ft. lengths, connected with screw sockets. These were placed so that no two joints were in the same cross-section of the beam. At the end of each section short ¼-in. dowels were placed at 2-in. intervals over the part of the beam subject to traction to improve the adherence between the sections.

The work proceeded regularly and without any difficulty, although a sudden flood washed away the falsework under both shore spans, fortunately after they were self-supporting. Also, all work had to rest for a week during the beginning of the revolution, when much fighting took place in the vicinity. The center span was closed on October 29, 1930. One month afterward the bridge was tested under full live loads. Up to date no crack has appeared.

The bridge was designed by the firm of Emilio H. Baumgart, consulting engineer in Rio de Janeiro, with the author in charge of design and control.

Rapid and Accurate Mapping in Semi-Arid Regions of Texas

Standards of accuracy and methods of procedure used in surveying 153,736 acres for an irrigation development in the lower Rio Grande valley—Work done by contract—Independent check lines run

By JAMES E. GODDARD
Morgan Engineering Co., Harlingen, Tex.

PLANNING the construction of an irrigation system in Texas for the Willacy County Water Control and Improvement District No. 1 required a topographic map of 153,736 acres from which earthwork quantities could be estimated closely. In order to obtain the map within the shortest time consistent with accuracy, a subcontract for this work was made by the district engineers with a firm of topographic engineers specializing in map making.

The region mapped lies in the semi-arid alluvial plain of the lower Rio Grande valley. From about 65 ft. above sea level at the western boundary the land slopes to an elevation of 15 to 20 ft. at the eastern edge. In the western third of the area this slope averages 2 ft. to the mile, but the land is dotted by many knolls 10 to 20 ft. high formed by wind action on the sandy soil many years ago, before vegetation was dense. In the eastern part the slope is about 1 ft. to the mile. The entire area is practically devoid of natural drainage channels, as the sandy loam retains the rainfall with small runoff. About half of the area is cleared and dry-farmed; the remainder is virgin brush land covered with a dense growth of small trees and shrubs, mesquite being the predominant tree growth. Cactus, mostly of the prickly pear variety, grows thickly, and its thorns and spines are an added hazard for the surveyor, as even high leather boots are not proof against the needle-pointed spines. Wild life is still prevalent but is diminishing as the brush land is being cleared and cultivated.

Map Specifications—To insure the degree of accuracy desired specifications were agreed upon by the district engineers and the mapping company. Their main points may be summarized as follows:

Scale to be 1,000 ft. to the inch, with contours at 1-ft. intervals. All traverses and levels to be adjusted. Primary horizontal controls to be taped transit circuits with closure errors not exceeding 1:2,500. Supplemental horizontal controls to consist of a network of transit stadia or taped traverse circuits tied to the primary control lines and to one another. Supplemental traverses to be not more than 2 miles apart, with a closure accuracy of 1:1,500 and a maximum closure error of 20 ft.

Base-line levels to be run over the primary traverse or equivalent lines, this base being a double-check level line having an error of closure of less than 0.03 times the square root of the distance in miles. Supplemental level lines, not more than 2 miles apart, to close with an error of less than 0.05 times the square root of the distance in miles. Semi-permanent benchmarks to be so distributed that all territory will be within about a mile of a bench.

Topography to be filled in by plane-table, with plane-table traverses generally closed about half way between level lines. Position error of closure not to exceed 35 ft., and all closures to be adjusted so that no traverse station is in error by more than 20 ft. Level closure to be within 0.3 ft. The survey to indicate within an error of 20 ft. the location of railroads, highways, roads, main fences, dwellings, bridges and culverts. Other features to include cleared land, timber, streams, ponds, marshes and land subdivision lines. In towns where blocks are built up only streets need be shown, but where the blocks are not built up the buildings must be shown. Maps to be so accurate that 90 per cent of the elevations interpolated between contours will be correct within half of the 1-ft. contour interval; 90 per cent of all lines less than ¼ mile long to scale within 1/100 in. and 90 per cent of all longer lines within 1/50 in. All lines to scale within 1/20 in. Elevations taken to be shown on the map.

A bar to progress

Plane-tables for mapping were adopted in preference to the transit stadia method. With the former, distances and levels only are read, whereas the latter requires azimuth also and then all three must be computed and plotted, with chance for error in each step. With plane-tables, contours are sketched from field observation, which leads to accuracy. Plane-table methods were also considered more economical in obtaining the 20-ft. location accuracy. Aluminum-backed sheets 24x31 in. were used to reduce the effects of expansion and contraction.

Horizontal Control—Traverse lines were usually located along the center lines of roads or adjacent to fence lines where there were no roads. These were run as random lines, with angles turned at each traverse station, the stations being referenced for future recovery. These lines were from 1 to 2 miles apart, with sufficient cross-ties to limit the average length of a circuit to not more than twice its width. Because of the necessity for a prompt start a few circuits were adjusted as connected loops without regard to the general traverse scheme.

A zero azimuth that coincided with the subdivision lines and very closely approximated magnetic north was

used throughout the western half of the map. For the remainder, a true-north meridian, based on two Polaris observations 4 miles apart, was used. Convergence of meridians was applied to the astronomic azimuths and the true meridian passed through Raymondville, within the mapped area. Another Polaris observation was later taken about 7 miles from Raymondville for a check. As soon as the traverse had progressed far enough ahead of the mapping parties certain traverse lines, chosen because of their better location, were termed "main" lines. These were then adjusted and the azimuths and coordinates fixed, the intermediate lines being adjusted to these fixed azimuths and coordinates. In this manner the entire control for the map was unified.

Vertical Control—The datum is mean sea level as taken from benchmarks of the U. S. Coast and Geodetic Survey and the U. S. Geological Survey. The main lines were circuits of double-run level lines tying to each other and also to all U. S. benchmarks available, and ran nearly parallel to the main traverse lines. About a third of the level lines were double run. The error of closure in these lines was usually less than specified.

Supplementary lines were run and semi-permanent benchmarks on these, as well as on the main lines, were set at intervals of about half a mile. Permanent benches will be set from these in the future. These supplementary lines roughly parallel the supplementary traverse lines. Considerable difficulty was encountered in running level lines, as the almost continuous breeze disturbed any level not firmly set up and the brilliant sunshine produced such heat waves that on the main level lines it was necessary to use a precise level with an umbrella. Distances between turning points had to

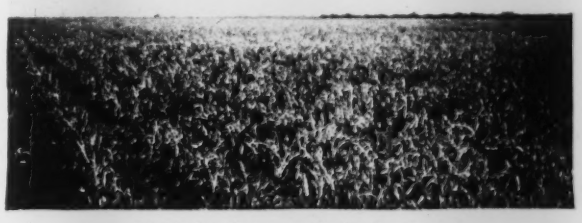
Filling in details with a plane table

be decreased from the ordinary 300 ft. to 150 ft. during the middle of the day because of the heat waves.

Separate adjustments were made for the eastern and western parts of the map, as a U. S. Coast and Geodetic Survey line of levels separated them. Each part was adjusted as one unit, using the junction point method, the elevations of these chosen junction points being fixed by the weighted-mean method. The weights of the elevations used for the double-run lines were inversely proportional to the square root of the distance from an accepted starting point. This weight was divided by two for the weight of the single-run lines. After the elevation of a junction point had been fixed it was used as a known starting point for computing intermediate junction point elevations. After all junction point elevations had been computed, the discrepancies in the level lines connecting these points were distributed directly proportional to the distances, as the distances and discrepancies were small. This level adjustment was one of the finer points of the mapping.

Benchmarks in the brush area present a problem as to preservation. They were set in notches in trees, usually far enough back from traverse lines to be outside the limits of a 60-ft. road. But when brush land is cleared for cultivation, it is usually cleared clean. The only safe plan is to transfer the marks to permanent concrete or metal benchmarks before many are destroyed by the advance of cultivation.

Topography and Culture—Traverse stations were plotted on the aluminum-backed sheets in the office by the rectangular coordinate system. The topographer then recovered these in the field and obtained elevations from benchmarks. Using plane-table traverses and levels, the



Typical culture—a field of onions

cultural and physical features were plotted. Contours were interpolated in the field by the topographer. After the field work and when as many property corners as practicable had been identified, the property on the sheet was completed by plotting from the records.

Property lines and corners identified in the field governed the property layout, which is of an unusual character. When Spain owned this region the king made grants of land, and these grants are recognized by the state of Texas. When the lands passed to heirs they were subdivided, and as this has happened several times, and as there were generally several heirs, it has resulted in many different types of subdivisions. As the old field notes are sometimes inaccurate and many property corners are now missing, the task of accurately showing subdivisions is complicated.

Surveying in Brush—Of the 153,736 acres mapped, 81,190 are in brush so dense, tough and thorny that the most economical method was to have parallel "senderos," or pathways, cut at intervals of 660 ft. The topography party ran profiles down these lines and took side shots, which required some additional clearing. Readings were taken as far as 200 to 250 ft. from the lines, leaving a space of 160 to 260 ft. uncovered. If the readings taken showed any unusual changes in the ground surface, or if the rodman saw any unusual change beyond his last reading, the topographer followed into the brush and obtained the necessary critical points, although this took considerable time and labor. The mapping was carried on rapidly, as most of the shots could be obtained from the senderos after a little trimming of branches. About 812 miles of senderos were cut, generally 3 ft. wide to a height of about 7½ ft., but some were 6 ft. wide where they were to remain open longer.

Virgin brush of mesquite and prickly pear

This clearing was let to a contractor, who paid his Mexican laborers by the mile. It is remarkable how fast and accurately they could work. An engineer gave them two or three guide stakes, approximately 150 ft. apart, and the average sendero did not vary from alignment more than 15 ft. in a mile. Many of the more skilled laborers would check much closer than this. A party of two Mexicans would cut more than a mile per day.

Checking Topography and Culture—Soon after the mapping had been started, check profiles were started by the district engineers, an effort being made to run the check profiles for each sheet soon after the field work on it was completed. New senderos were cut in the brush areas, and profiles were run in these for an independent check on the mapping. These check profiles also located many cultural features as a check for the map. Other cultural features were checked by field measurements and inspection by the district engineers and by direct comparison with subdivision plats and deed records.

The elevations of points on the check profiles were tabulated, and also the elevations of corresponding points on the map. The difference was noted and checked with the specifications. If the sheet was within the specified limits, the office could begin work on it. If not, it was studied carefully for errors and returned to the field for corrections or checks, after which it was again checked from the original check profiles or additional profiles. It was never necessary to take a sheet to the field the third time. Some sheets needed only a more studied sketching of contours to come within the specifications. Only five were returned to the field for correction.

Organization and Progress—Field work was begun on July 5, 1929, and completed on Feb. 20, 1930. It was delayed somewhat by additional subdivision connected to the horizontal control system and by the desire for close accuracy. The average force consisted of one level party, one traverse party, from three to five plane-table parties, one office engineer and one draftsman. The size of the plane-table parties varied with the nature of the country and the ability of the topographer, the principle being to have a party so balanced that every member would be kept busy. In cleared areas each party consisted of one plane-table man and two rodmen. In the brush there were three rodmen; in the heaviest brush four rodmen and a recorder. The rodmen did necessary additional clearing. The topographer took the readings and plotted the points as given by the recorder, who immediately computed each reading. In this manner rapid progress was made, even though many extra shots were taken because of the brush screening the contours of the land.

The field force averaged 3.2 topographic parties in the field, and the average area mapped per working day by one party was 245 acres, including time for correcting sheets returned to the field. The maximum area mapped by any one party in one day in the cleared area was 710 acres and in the brush 510 acres, but the maximum brush area averaged about 300 acres by any one party. Transportation service was required, as the parties were separated so as to progress more rapidly. Offices and camps were located in small towns within the area, and automobiles were used for transportation. For the western portion of the work the office was at Elsa, and for the eastern portion in Raymondville, the county seat.

Coordination of Mapping, Design and Construction—To expedite design and construction, the mapping program was closely coordinated with the design work, areas for the first mapping being selected where design and construction were to begin. Photostats of field sheets were made at night and used for preliminary design before the sheets were completed. This advanced the design materially and made it possible for construction to start before the mapping was finished.

Personnel—The Morgan Engineering Co., Memphis, Tenn., is the engineer for the district. Ned H. Sayford, vice-president; B. B. Brier, project engineer, and the writer were in charge of the work. The surveys and map were made by R. H. Randall & Co., Inc., Toledo, Ohio, with C. D. Whitmore, vice-president, in charge of operations.

Welding Stainless Steel

The most extensively used of the stainless steels is the 18-8 type containing 18 per cent chromium, 8 per cent nickel, small amounts of manganese and silicon and in which the carbon varies from 0.15 to 0.06. According to G. Van Dyke, manager, special steel department, Joseph T. Ryerson & Sons, Inc., the first consideration in gas-welding this material is to get the proper mixture of acetylene and oxygen. An excess of oxygen will burn up a considerable portion of the chromium, producing welds that are porous and of low corrosion-resistance value. An excess of acetylene increases the carbon content of the weld, which is detrimental to corrosion resistance and produces a brittleness. A neutral flame is ideal, but in actual practice regulators are not sufficiently accurate to produce such a flame. A practical flame is one in which there is a slight excess of acetylene, which is indicated in the flame by very short "feather tips" on the end of the combustion button. The torch should be held as close to the metal as possible. Puddling should be avoided, as it tends to produce a porous weld. The tip is one or two sizes smaller than would be used on the same gage of steel, and in most cases about 5 lb. pressure will be found sufficient.

In electric welding this metal, flame chemistry is not important, but it is important that the rod be of the right analysis and that the coating on the rod be of such character that it will produce sound welds, deep penetration and a bead of equal corrosion resistance to the parent metal. Reversed polarity should be used and rather less power than on a similar gage of steel.

Denver to Get New Line to West Through Moffat Tunnel

Transfer of control of Moffat Line to the D.&R.G.W. Railroad assures construction of Dotsero cutoff

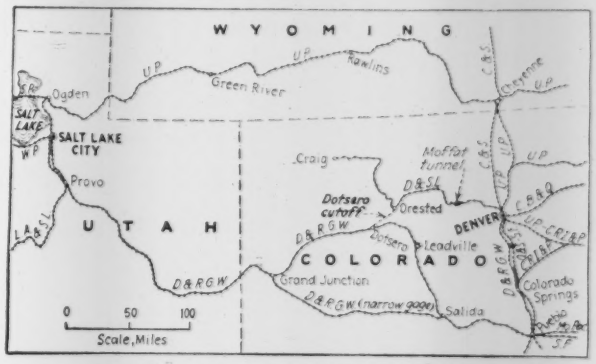
CONSTRUCTION of the Dotsero cutoff to connect the Denver & Rio Grande Western Railroad with the Moffat Tunnel, and thus shorten the former's route to Salt Lake City, is assured by the formal acceptance by the D.&R.G.W. Railroad of the conditions imposed by the Interstate Commerce Commission, under which it may acquire control of the Denver & Salt Lake Railway (Moffat Line). By the construction of the cutoff Denver will obtain a long-sought direct rail outlet to the West and will be placed in a position to reap at least partial benefit from the money spent in the building of the Moffat tunnel and in promoting the construction of a through line to the West.

Denver has been shut off from direct railway communication to the West by the mountain range of the Continental Divide, traffic from Denver having to go north to Cheyenne (to the Union Pacific) or south to Pueblo (to the D.&R.G.W.) before turning west. A project to pierce the mountain barrier and build a line across the northwestern part of the state to Salt Lake City had its inception in 1902, under the leadership of the late D. H. Moffat, with the chartering of the Denver, Northwestern & Pacific (now the Denver & Salt Lake). This line was completed as far as Craig, Colo., in 1909. When the work was started it was proposed to build eventually a long tunnel at about El. 9,000 above sea level, but lack of funds and the desirability of early railway communication with the district west of the range led to the construction of a line crossing the divide in an open pass at El. 11,500, and having extremely heavy curvature and grades up to 4 per cent. Operating conditions over this mountain line were so severe that it was soon apparent that a tunnel must be built if the line was to be used for through traffic to the West. However, there were no funds for completing the extension to Salt Lake City. More recently the Interstate Commerce Commission has refused to authorize construction of such a line.

Since the railroad was evidently unable to carry out its tunnel project, steps were taken to finance it as a public enterprise, but plans for bonds to be issued by the city of Denver and by the State were unsuccessful, as described in *Engineering News-Record*, Dec. 13, 1923, p. 962. A tunnel commission appointed by the state legislature in 1918 recommended the construction of the tunnel, and in 1922 the legislature created the Moffat Tunnel Improvement District, with authority to issue bonds for the construction of the tunnel. The district in addition to the city of Denver, included three complete counties and portions of five other counties; but 90 per cent of the assessed valuation included in the district was within the limits of the city of Denver. The act limited the amount of bonds to be issued to the estimated cost of constructing the tunnel—$6,720,000. At that time it was expected that upon completion the tunnel would be leased to the D.&S.L. Railway at a figure sufficient to carry the major part, or all, of the interest and amortization charges, and that the pioneer bore could be leased to Denver as a water tunnel.

Construction of the tunnel was begun in September, 1923, and it was completed and opened for traffic in February, 1928. Due to unusual difficulties involved in construction, the total cost of the tunnel at the time of its completion reached $15,470,000.

In January, 1926, the Moffat Tunnel commission leased the tunnel to the D.&S.L. Railway for a period of 50 years, with an option to extend the lease for 49 years, under a contract that stipulated that the company would pay 66⅔ per cent of the interest and principal (as bonds mature) of the indebtedness outstanding at the time (about $8,200,000) and all operating and maintenance costs of the railroad tunnel. It was expected then that the railroad company would raise funds for the immediate construction of the Dotsero cutoff, giving the tunnel a connection with the D.&R.G.W. Construction of the cutoff was not undertaken, however, and payment of the first 4½ months' tunnel rental



Railway lines around Denver, showing their relation to the Dotsero cutoff

on July 1, 1928, by the railroad company was accompanied by a statement to the tunnel commission that the rent was more than the saving in hauling costs over the abandoned high line and that unless more freight traffic were obtained, the tunnel would become a liability.

In the same months a taxpayers' suit was brought against the Moffat Tunnel commission for the cancellation of $8,750,000 in bonds issued by the commission above and beyond the originally authorized issue of $6,720,000. These additional funds had been raised by the commission as required, without going to the voters for authority. The taxpayers' suit was unsuccessful, the court declaring that the law directed the commission to build a tunnel and that this authorized the commission to borrow sufficient money to complete the tunnel despite the additional provision in the original law that bonds were to be issued not to exceed $6,720,000.

Early in 1929 the commission attempted to collect from the railroad an annual rental of $550,000 based on its oustanding bond issue of $15,470,000. This the railroad refused to pay, claiming that its obligations ceased in paying $292,000 rent based on the $6,720,000 bond issue of the original estimate plus $2,500,000 voted by the commission at the time the lease was signed. Injunction proceedings were started to determine the validity of the lease. In September, 1929, the lease was held to be valid by the Federal District Court. An appeal from this decision was taken to the U. S. Supreme Court in September, 1930, and in April of this year the Supreme Court declined to review the decision of the lower court, thus maintaining the validity of the lea

and contract. This left the district without any way to recoup the cost of more than half the tunnel except through a tax upon the tunnel district. Use of the pioneer bore made in constructing the tunnel as a water-supply tunnel for Denver so far has not been found necessary, and at present the city is only paying the commission a nominal rental of $1 a year and maintenance costs. The district commission has power to grant trackage rights through the tunnel to railroads other than the one holding the principal lease.

Meanwhile the D.&G.R.W. Railroad undertook to gain control of the D.&S.L. Railway, the holder of the tunnel lease. As the latter would become a potential competitor of the D.&R.G.W., should it be continued through to Salt Lake—as any direct outlet from Denver to the West, through the tunnel, would have to be either through the extension of the D.&S.L. to Salt Lake City or through the construction of the Dotsero cutoff by either the D.&S.L. or by the D.&R.G.W.—the Interstate Commerce Commission in granting permission to the D.&R.G.W. to acquire control of the D.&S.L. made this conditional upon the start of construction of the Dotsero cutoff within six months of formal acceptance of the permission and its completion within two years. The D.&R.G.W., on July 18, accepted the commission's decision. Hence construction of the cutoff will be begun before the end of the year. The line will be 42 miles long and is expected to cost about $3,500,000.

Construction of the D.&S.L. Railway as originally projected, would have given a 565-mile line between Denver and Salt Lake City, as compared with 620 miles by way of the Union Pacific at Cheyenne and the 745-mile line by way of the D.&R.G.W. through Pueblo. Construction of the Dotsero cutoff will shorten the D.&R.G.W. route to Salt Lake by about 135 miles, or to 610 miles.

Operating Automobiles at Three Cents a Mile

Capitalizing distance reduction at higher figures is unwarranted—Operating-cost records of two private and 316 road department cars proves statement

By N. D. DOUGLAS
Assistant Engineer Surveys and Plans, State Division of Highways, Sacramento, Calif.

A STUDY to determine a definite evaluation of route distance, which is a factor of major importance in highway location, was published in *Engineering News-Record*, Aug. 2, 1928, p. 168. This was a result of an individual preliminary study. It was pointed out in that article that the cost of owning and operating a passenger automobile can be itemized under time and mileage elements. The latter group alone is affected by the distance traveled by the vehicle. The tentative conclusion reached was that approximately 3c. per mile of the total cost of operating the average American passenger automobile at 30 to 40 miles per hour on paved roads of normal characteristics is due to distance and is nearly directly proportional thereto at any given speed.

The article excited some comment, as it had been customary for highway engineers to evaluate route distance at from 6 to 12c. per vehicle mile and to base location and design analysis on these assumed valuations. The bulk of the comment was definitely adverse, indicating that most interested engineers were not willing to give up the general accepted assumptions without further proof to substantiate the correctness of the new proposed value. The dissenting opinion was not supported in any detail by actual experiment.

Summary of Actual Cost Records

During the past two years the writer has gathered a considerable volume of additional practicable data on this subject, which is given in the accompanying table.

Column I tabulates an estimate made in 1928 of the average nation-wide passenger-automobile operating costs on hard-surfaced high-gear roads with normal grades and curvature.

Column II is a summary of the operating record of a car owned by the writer. The record started when the car was three years old and extended over a period of 24 months. The mileage was run approximately 5 per cent in city traffic and 95 per cent on the open road; approximately 50 per cent on hard-surfaced roads in fair condition and 50 per cent on ordinary gravel or earth roads, most of which were dry but often steep, rough or sandy, requiring considerable use of low gear. The average high-gear speed was about 25 miles per hour. All mechanical work except chassis lubrication was done commercially at standard garage prices and included a complete overhauling of the transmission system. At the end of the observation period the car was in excellent condition in all respects. On the basis of 22c. gasoline and 35c. oil the total cost would be 2.53c. per mile.

Column III is a summary of the operating record of the writer's own car. The record started when the car was brand new and has extended over a period of 30 months. The mileage was run approximately 15 per cent in city traffic and 85 per cent on the open road; approximately 70 per cent on surfaced roads (in an average condition equal to a fifteen-year-old asphalt or concrete pavement) and 30 per cent on unimproved mountain and desert roads, in all stages of repair, involving many miles of low- and second-gear operation; at speeds averaging as close as practicable to 40 miles per hour on good roads. The unimproved roads were practically all dry but often very rough or sandy. The best grade of Eastern oil was used in the crank case and changed completely every 1,000 miles. All mechanical work and most of the greasing (except the chassis lubrication) was done commercially and paid for at standard garage prices. The car was equipped with five four-ply tires when new and now has six eight-ply tires in excellent condition. The grease item is almost entirely a labor cost. The maintenance item includes 0.13c. per mile for replacement of parts injured by accident. This had no relation to mileage. Shortly prior to the end of the recorded period the valves had been ground, motor tuned, brakes and wheel alignment checked, etc., the costs being included in the figures shown in the table. The car was in excellent condition in all respects.

Attention is called to the fact that the cost of both gasoline and oil shown in column III is higher than the average. Using 22c. gasoline and deducting the 0.13c. due to accident, the total operating cost reduces to 2.52c. per mile.

Column IV is a summary of the average operating

record of 318 cars of various models produced by sixteen different manufacturers, owned and operated by the California state department of public works, practically none of which had run less than 20,000 miles. The tabulated data are derived from the accounts of the department. These cars were operated under all conceivable conditions over all types of roads, a large part of the average mileage being in city traffic, over difficult unimproved mountain and desert roads, going to construction jobs, and not infrequently in cross-country travel without roads in connection with preliminary surveys in the desert regions. The average speed probably was as close as practicable to 45 miles per hour on good roads. The gasoline, oil and grease cost items are rather low, largely on account of the lower prices of these supplies when bought in large quantities. The maintenance item is very high, as would be expected, considering the exacting service required of these cars. The average operating costs of the four-cylinder and of the six-eight cylinder cars, grouped separately, were nearly equal, and closely approaches the average. This probably is due largely to the fact that the lighter cars were used generally in the more severe service as line cars on construction projects, etc., while the heavier cars made longer trips anfd traveled a greater proportion of their mileage on good roads. On the basis of 22c. gasoline and 35c. oil the total average operating cost would be 3.94c. per mile.

PASSENGER-AUTOMOBILE OPERATING COSTS

	Original Estimate, *Eng. News-Record* Aug. 2, 1928 I	One Ford Model-T Touring Car II	One Dodge Victory Six Sedan III	Average of 318 Cars of 16 Makes and Various Models IV
Total mileage run		13,225	24,653	38,894
Period of observation		Apr. 1926-Apr. 1928	Apr. 1928-Oct. 1930	1924-1929
Miles per gal gas	17.19	23.2	17.52	15.49
Miles per qt. oil	100	98	147	108
Gasoline cost (cents per gal.)	22.00	20.3	23.92	
Oil cost (cents per quart)	22.50	31.8	35.00	
Gasoline, cents per mile	1.28	0.87	1.37	
Oil, cents per mile	0.21	0.32	0.24	†1.31
Grease, cents per mile		0.02	0.12	
Maintenance, cents per mile	*1.24	0.92	0.52	*1.80
Tires, cents per mile	0.50	0.28	0.51	0.49
Total	3.23	2.41	2.76	3.51
Total operating cost per mile based on 22c. gas and 35c. oil	3.37	2.53	2.52	3.94

*Grease and maintenance. †Gas and oil.

Without theorizing or assuming in the slightest degree, columns II and III show the *actual* cost of operating two representative cars under normal general conditions by a driver of average ability. Normally, where the condition of the road would permit, the legal speed limit was crowded and often exceeded, 45 to 50 miles per hour being not uncommon in connection with column III. Column IV shows the *actual* average cost of operating representative cars under unusually severe business conditions by drivers of average ability. In this last case the drivers were not the owners and therefore must have lacked the personal interest that an owner would have.

Conclusions From Cost Records

Now if all the mileage of the cars considered above had been traveled on hard-surfaced rural roads such as the states are building today, it is obvious that the operating cost would be reduced greatly, especially in the maintenance item. It is equally obvious that in deriving a factor value for route distance the highway engineer must derive an operating value for traffic *on the type of road he proposes to build*, and he cannot use an average value obtained from operation on all types of surface.

It must be remembered also that a certain indeterminate portion of the tire and maintenance cost is independent of mileage and due to time and weathering. This includes rusting, deterioration of paint, top, upholstery, etc.; a portion of the deterioration of springs, snubbers, tires; most of the radiator expense; much of the electrical expense, etc. Much of the wear of these details is due to standing in sun, rain, and dust, and failure to keep the car properly clean. The writer has access to no reliable data regarding operation solely on hard-surfaced rural roads, but he does believe that the authentic records of general operation tabulated above indicate strongly that the cost of passenger-automobile operation on a normal hard-surfaced high-gear road is well under 3c. per vehicle mile. The figure does not apply to trucks, which are not considered here.

The much-disputed items of time and depreciation are largely intangible. Time saved has an economic value only when it is used to increase production. Is the quarter minute, saved by reducing rural route distance about 900 ft., used productively? If not, then we cannot claim that its value helps to offset the cost of the distance reduction. Depreciation is almost hopelessly involved with obsolescence, time, luxury, pride, fluctuating market trade values, etc. A certain part of depreciation, but only a small, rather indeterminate part, can be charged to mileage—but how much?

The writer repeats his original conclusion made in 1928 that, in general, expenditures for the purpose of route-distance reduction on modern hard-surfaced rural highways are premature and economically wasteful if based on a capitalization of passenger-car operating costs assumed to exceed 3c. per mile. It is emphasized strongly that this is a distance value which must not be confused with grade, curvature or other values, although it is believed that these latter, within the normal limits of good practice, will have relatively little effect on passenger-car operating costs.

The 3c. limit naturally is an approximation subject to some variation. For example, an increase in the *average* prevailing road speeds, unusually heavy grades or curvature and various unusual conditions of traffic might tend to increase the operating cost or bring the time element into prominence. But it might be remembered also, for instance, that the light economical car presents great future possibilities for operating economies (witness the little Austin car); that road speeds usually decrease as population and traffic grow; that additional roads often relieve traffic congestion and save time more efficiently than reduced route distance alone, especially in suburbs.

A competent business firm would not make additional capital investment for the sole purpose of earning a return thereon unless the return were definitely in sight. Highway building is a business. When a highway organization considers the cost of rural distance reduction alone on a hard-surfaced road, 3c. (or less) per vehicle mile of reduced distance is definitely in sight as a return on the additional investment. An investment based on a greater return should not be made unless those in charge can prove without assumptions that the greater return is in sight and *will continue* through a sufficient period to pay a suitable interest and return the entire additional principal to the generation which invested it.

Belt Conveyor Plants for Placing Dry Concrete

Combination hoist tower and suspended belt conveyor plants employed successfully on large German dam and lock structures

By BRUNO WIDMANN
Dyckerhoff & Widmann, A.G., Wiesbaden-Biebrick, Germany

BELT CONVEYOR plants for handling dry mixtures have been highly developed for recent concrete construction operations in Germany and Austria. The accompanying illustrations show four of these plants and indicate the combination of hoist tower and belt conveyor system that has been employed. This combination

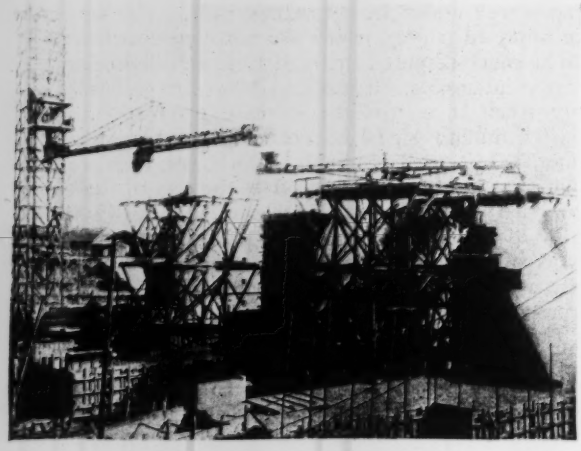


Fig. 1—Tower plant and auxiliary conveyor at Mannheim locks

was first used in 1925 in constructing a double lock near Mannheim.

A traveling tower fitted with a trussed boom carrying two belt conveyors and having two hoists placed concrete in a double lock 394 ft. long. Later an additional belt conveyor mounted on wheels was provided and placed

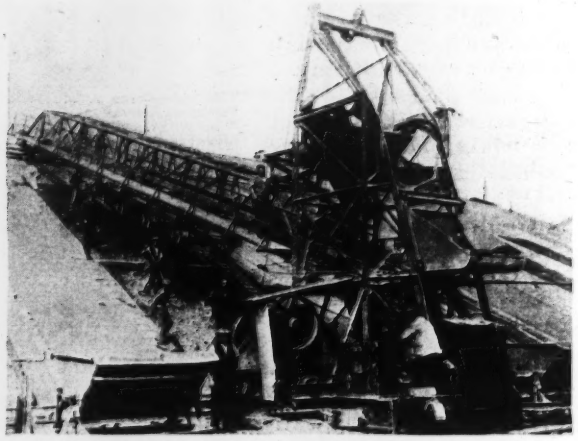


Fig. 3—Twin tower plants used in constructing Hamburg quay wall

some 60,000 cu.m., the maximum daily output being 1,000 cu.m. This plant is shown by Fig. 1. With improvements in detail the same plant was subsequently used for placing the concrete on a lock 820 ft. long at Grosswusterwitz, near Berlin. This second application is illustrated in Fig. 2.

Fig. 3 shows another plant with two towers that was used in 1926 in constructing a quay wall 3,940 ft. long at Hamburg. With this installation very substantial daily outputs were obtained and a total of 45,000 cu.m. of concrete was placed.

The concreting of the canal banks of the hydro-electric works at Oberwartha, near Dresden, was done with the installation shown in Fig. 4. A logical further development was that of the plant used on the great dam at Vermont in the Austrian Alps where 145,000 cu.m. was placed with a transporter plant consisting of three towers and belt conveyors 1,312 ft. long, on which the concrete was carried from the mixing plant to the towers. The slewing jibs from the towers that carried the belt conveyors were strengthened to carry what might be termed "fliers"—that is, belts working in any direction needed from the end of the jib belt. With this arrangement each tower covered an area of 280 deg. by 131 ft. radius, and had a theoretical output of 100 cu.m. per hour.

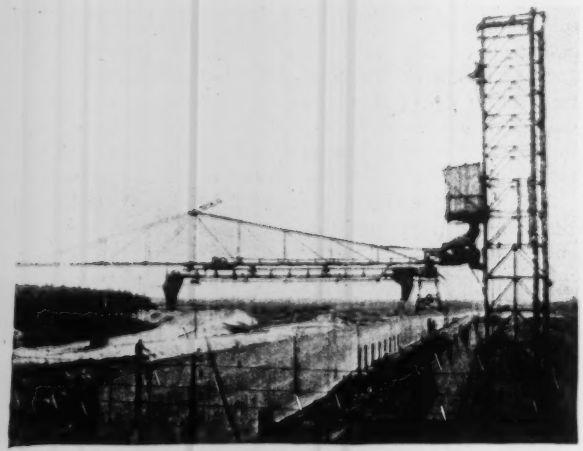


Fig. 2—Tower plant with telescoping belt conveyor at Grosswusterwitz lock

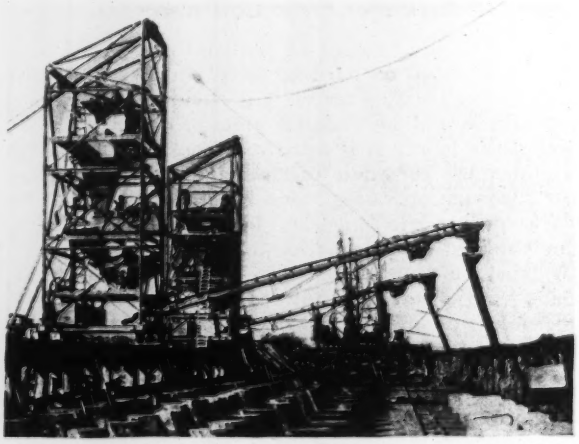


Fig. 4—Plant for concreting canal banks, Oberwartha hydro-electric plant

Big Tujunga Arch Dam 240 Ft. High Added to Los Angeles Flood-Control System

Structure forms unit in plan to control flood peaks from 100-square mile watershed to permit complete absorption in spreading grounds—Variable-radius arch with gravity abutments

By E. C. EATON
Chief Engineer, Los Angeles County Flood-Control District

COMPLETION of the Big Tujunga Dam No. 1 provides the initial unit in a flood-control plan of the Los Angeles County Flood-Control District to control the runoff from about 100 square miles of the Big Tujunga watershed to allow complete absorption in spreading grounds for replenishment of underground storage basins. The structure is a variable-radius type, concrete-arch dam, 240 ft. high with gravity abutments. The spillway structure is designed for a runoff of 400 sec.-ft. per square mile of catchment area and is built as part of one of the gravity abutments. Features of the project included intensive geological investigations, care in preparing excavation and concrete estimates (which permitted completion within 85 per cent of the estimated quantities) and careful concrete control.

The Big Tujunga Dam, located about 29 miles from Los Angeles, provides 7,500 acre-ft. of regulating capacity and the first step in dampening of floodflows from this watershed to permit their being absorbed by spreading grounds. The regulative storage cost of $120 per acre-foot might seem excessive if surface storage were used, but the function of the reservoir is to flatten out peak floods and thus provide a much higher value per unit of capacity. The annual yield of the watershed, according to existing records, varies from 103,000 acre-ft. to a minimum of 600 acre-ft. The estimated maximum flood is 35,000 sec.-ft., and the record for a sixteen-year period is 13,600 sec.-ft. Completion of the other three dams will provide a total capacity of 47,500 acre-ft., which will be sufficient to regulate the flow onto spreading grounds that will have an absorption capacity of 3,000 acre-ft. per day. The underground storage reservoir to be used in conjunction with these regulators has a present capacity of more than 220,000 acre-ft.

The site was thoroughly explored and checked by two separate geological studies and found to be entirely adequate. The rock is a granitic formation, and although within the general region of recognized faults, it is within a large undisturbed block of the San Gabriel range that is free from large dislocation. Test cubes cut from some of the poorer sections of rock showed compressive strength of 11,900 and 13,550 lb. per sq.in.

Design—The central section was designed as a variable-radius arch of 240-ft. maximum height and 400-ft. crest length. The upstream radii vary from 190 ft. at the crest to 120 ft. at the base, and the corresponding arch thicknesses are 8 and 73 ft. Standard stress calculation procedure was followed, using Cain's formula. Contraction joints are at 50-ft. spacing and have adequate provisions for grouting. The effect of disregarding the temperature stresses was partly counterbalanced by disregarding any cantilever action tending to support the arch rings. Although not used in calculating arch stresses, the load division between arch and cantilever action was computed at the crown section and, assuming that the concrete withstands tension, deflections and load divisions are shown in Fig. 2. Maximum arch section and general features are shown in Fig 3.

Fig. 1—Arch dam provides flood regulation to permit filling underground reservoir

For a short section the base was poured thicker, from upstream to downstream face, than called for by the design requirements, in order to permit slight shifts in alignment if required by developments in abutment excavation.

The gravity abutments, 100 ft. high at the north end and 64 ft. high at the south, were designed for full arch thrust plus direct water load. At the north abutment, which includes the 120-ft. length of overflow spillway section, exceptional foundation conditions allowed an uplift factor of 50 per cent full hydrostatic head at the heel, decreasing uniformly to zero at the toe. For the south abutment, uplift was taken as 100 per cent at

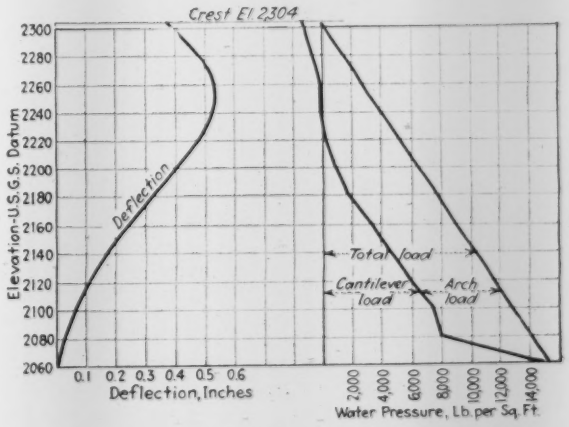


Fig. 2—Calculated distribution of load in arch and cantilever. Crest deflection is under load

the heel. Grout holes 150 ft. deep at 20-ft. intervals were drilled in the bottom of the cutoff trench and grouted under 100-lb. pressure.

Stress Measurement—Since the design of the dam was based on the independent arch rings carrying the entire water load, and as it is to be expected that other influences of vertical bending, tangential shear and non-uniform temperature changes may alter the stresses as computed, plans were made to measure temperature and strain distribution in the important sections. Electric thermometers and strain gages were embedded at various elevations in the crown cantilever, at the abutments and at regular intervals in the crest arch ring. Details of these gages and their principles will be described in *Engineering News-Record* at a later date.

Temperature records indicate the expected rise in the concrete mass from the time of placing. A typical group of readings is shown in Fig. 4 for three thermometers in the crown section 58 ft. above the base with an arch thickness of 51 ft. Measurements of temperature in the structure will be continued. Strain-gage readings have been started and important measurements will be obtained on the first filling of the reservoir and observations under water load.

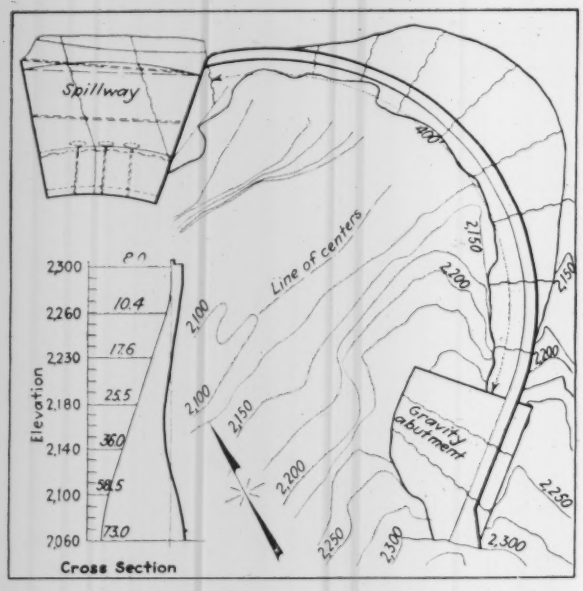


Fig. 3—Plan and maximum arch section of Big Tujunga Dam

The outlet system consists of three openings with a maximum discharge capacity of 3,500 sec.-ft Close regulation is provided by a 60-in. needle valve equipped with an emergency slide gate. Additional outlet capacity is provided by one 48-in. and one 62-in. pipe outlet, each provided with square slide gates. All slide gates are hydraulically operated from central control in the needle-valve house, by means of horizontal cylinders supplied from a tank on the hillside 300 ft. above the dam. In addition to these three operating outlets, a sluice gate 60 in. square is provided. Remote control from the crest of the dam is provided, in addition to the control from the needle-valve house.

Construction—Excavation included 67,000 cu.yd. of rock and 14,000 cu.yd. of river wash. Loose overburden was removed by power shovel and truck; 50 per cent of all excavation was dumped upstream from the dam. Rigid specifications covered shooting on the abutments

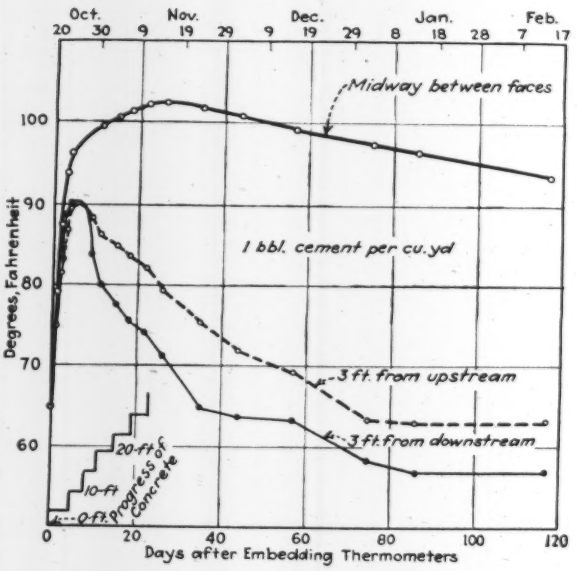


Fig. 4—Temperature rise in arch section 51 ft. thick

and in streambed. Final trimming was done by barring.

A gravel washing and grading plant was erected by the contractor at the site to provide aggregate. Trucks were used between plant and gravel pits, but all other aggregate conveying was done by belts. Two sizes of coarse aggregate, ¼ to 1 in. and 1 to 2½ in., were produced in addition to sand. Grading was designed to produce desired workability, density and strength with a minimum use of materials. Fineness modulus of the sand ran about 3.3. Cement averaged 1.05 bbl. per cubic yard; the w/c ratio was about 1.1. As an aid in reducing the heating effect, the cement specifications required that not more than 90 per cent by weight should pass the 200-mesh sieve.

Mixing was done in a 2-cu. yd. mixer, using weighing batchers and water meters. Following a 2-min. mix, the concrete was moved by belt conveyor to the base of a 320-ft. single-compartment steel hoisting tower, elevated and placed by the usual system of chutes and elephant trunks. The average rate of pour was 420 yd. per eight-hour shift and the maximum was 500 yd. Minimum time between pours was fixed at 72 hours.

Copper water stops were provided 12 in. from the upstream face, and galvanized iron stops about the same distance from the downstream face. Grout pipes were placed in the vertical contracting joints (50-ft. spacing).

The design and construction of the Big Tujunga Dam was carried out by the district under the general supervision of the writer. N. B. Hodgkinson, chief designer, and C. B. Gibbons, designing engineer, prepared plans, which were approved by L. C. Hill and F. A. Noetzil, consulting engineers, and the state engineer, in accordance with the California law. In addition, the plans and rock conditions were approved by the district engineer of the U. S. Forest Service, because the structure is located in the Angeles Forest. K. J. Harrison was resident engineer and R. W. Carlson was testing engineer. The dam was built by the L. E. Dixon Co., Los Angeles, with Harvey Whipple as superintendent. Total concrete yardage in the structure was about 83,000 cu. yd., and the total cost was $900,000. Dedication ceremonies took place May 27, 1931.

State Wage-Rate Regulation

Digest of various laws and rulings governing wage scales on public works construction with comments on their operation

REGULATION of wage rates paid by contractors on public works construction is affecting construction practices in many parts of the country and just now is extending rapidly as new laws go into effect. In some cases the laws are working smoothly; in others confusion and even serious delay to work under way or contemplated are reported. A telegraphic survey, published in *Engineering News-Record*, July 16, p. 112, showed (with one correction as below) that eleven states now have laws and nine others have rules or regulations pertaining to labor rates. Minnesota's 45c. minimum rate on state highway work, previously reported as law, is a ruling of the governor.

States having wage laws are California, Illinois, Kansas, Massachusetts, Nevada, Montana, New Jersey, New York, Ohio, Pennsylvania and Wisconsin. States having special rulings on labor rates are Arizona, Colorado, Iowa, Michigan, Minnesota, New Hampshire, Oregon and Wyoming.

The laws vary widely in scope. Some provide that actual wages to be paid must be stated in specifications or calls for bids. Others merely state that prevailing wages must be paid, without defining what a prevailing wage is, or how and by whom it is to be determined. The most serious delay to work that should be under way is reported from Illinois, where $10,000,000 worth of highway construction, a large unit of the West Side sewage-treatment works of the Sanitary District of Chicago and other projects have been held up awaiting formal opinion of the attorney general as to working of the law.

Digests of the laws of nine states with comments on their operation follow.

Illinois—The Illinois prevailing wage bill became a law effective July 1. The law affects all public work. It provides that awarding officials must predetermine the rates of wage that prevail in communities where the work is to be done, and that these rates, when advertised in the call for bids, shall be the governing rates. In case of dispute the state director of labor shall review the case, and his decision shall be conclusive, except that an appeal may be taken to an appeal board of three members to be appointed by the governor. The director of labor may investigate any case on his own initiative and must do so when petitioned by ten or more taxpayers. The law also provides that not more than eight hours shall constitute a legal day's work. Penalty for violation is the deduction of money due the contractor equal to the difference between actual wages paid and the prevailing rate established. The second violation will result in forfeiture of contract.

Reports from Illinois indicate that requiring the rate of wages to be published in the advertisement has set ahead the dates when many state road contracts can be signed. Estimates will probably have to be revised in many cases. Some $17,000,000 worth of the 1931 season's work has not yet been put under contract and will be delayed, perhaps until next year. Contracts for $10,000,000 worth of highway had been advertised before July 1 and must be readvertised. Such of this work as had not been estimated on union wage rates will need review. In Cook County 10 miles of highway will have to be readvertised and will be subject to two or three weeks' delay. Since the county has always estimated on the union scale, no revisions will need to be made in the estimates.

Contractors in Illinois are of different opinion as to the effects of the law, but all agree that it will prove beneficial in putting all bidders on an equal labor basis. They do not feel, according to J. V. Conrad, Cannel-Conrad Construction Co., Evanston, Ill., that it will drive officials to do more day-labor work. John F. Cushing, president of the Great Lakes Dredge and Dock Co., feels that the effect of the law will extend to private work and will cause delay until conditions become more settled. Myron B. Reynolds, acting city engineer, Chicago, says that of city work large contracts soon to come up will not be delayed, since the prevailing scale is set forth in the annual budget and these figures are adhered to in the estimates. Tunnel work, building work around pumping stations and all large pipe-line work is done by day labor and will not be affected, as the rates follow those in the budget. The Board of Local Improvement's work must conform to the law, as it is all on a contract basis.

Wisconsin—Wisconsin's prevailing rate of wages act became effective July 7. It applies only to state highway work and is primarily intended for the establishment of common labor rates, but it may be extended to mechanics and other classifications of labor upon the recommendation of the state highway commission. The prevailing rates of wages are established according to counties. After ascertaining in which counties state highway work will be conducted, the state industrial commission will hold at least one hearing in each county to determine the prevailing rates of wages. Then the industrial commission will advise the highway commission, which will incorporate the determined wages in the specifications for contract. If the highway department should disagree with the industrial commission, appeal will be made to the governor, whose decision will be final. Prevailing hours of labor will also be ascertained. Penalty for a first violation will be a fine not exceeding $200, or imprisonment for not more than six months, or both; upon second conviction the contract shall be declared forfeited.

The law is not delaying any work in the state because the attorney-general has ruled that it cannot become operative until the industrial commission has made a survey and determined prevailing rates. A form of wage control has been in effect in the state during the present year. Early this season the unemployment commission with the state grade-crossing elimination commission awarded many grade-separation projects, each contract specifying the prevailing rate of wages to be paid by the contractor. No trouble has been experienced in carrying out this ruling.

In Milwaukee David McKeith, commissioner of public works, states that a prevailing wage scale has been adopted each year before Dec. 31 for the ensuing year. The rate of monthly payroll mechanics and labor is

settled at the same time, but this can be changed. The rate scale is made a part of every contract. A minimum-wage-rate inspector sees that the scales are paid. On complaint the contractor's payments are held up pending investigation. Little trouble and no delays have resulted from this regulation. The greatest part of the inspector's work was in breaking up agreements of contractors with one or two men put on at less than scale rates, but with the understanding that they would have no layoffs. The practice has been broken up.

In the last legislature a law was passed providing that all employees of the metropolitan and city sewerage commission, either day labor or working for contractors, should be paid in accordance with a minimum-wage scale not less than the prevailing wages paid to similar employees of the county and municipalities of such county. The law is not satisfactorily worded in that the prevailing wage in the municipalities of the county is not uniform for similar types of work, but the difficulties apparently will be worked out satisfactorily. The Milwaukee sewerage commission is now engaged in adjusting its wage scale to meet the new law that encountered difficulty in Milwaukee, since the prevailing wage in municipalities of the county is not uniform, according to T. Chalkley Hatton, consulting engineer. All work done for the city for two years, by day labor or by contractors, has been carried on under a minimum-wage law. This is also true of the counties. Recently the board of education adopted similar provisions. These ordinances cover employees on the monthly payroll. No delays are anticipated so long as labor is plentiful and prices do not seem to be increasing, as all contracts are being let for below the prices paid a year ago.

Kansas—The labor law of 1923, providing for the payment of prevailing wages and an eight-hour day on all public works in Kansas, was revised by the 1931 state legislature. The new law defines the prevailing wage as the rate paid in the locality to the greater number of workmen in the same trade. In the event that there is not a greater number of workmen in the same trade being paid at the same rate, then the average wage paid shall be the current rate. A locality for the purpose of the act is defined as a county or a city of the first or second class. The eight-hour provision of the original act is retained. Calls for bids state that the prevailing rate must be paid, but they do not state the amount.

Occasionally there is confusion as to the prevailing rates, and in such cases the dispute is settled by the state labor commissioner. In general, the contractors use the same rate in estimating their labor cost, the rate usually being furnished by contractors' associations. No delay is reported due to the operation of the law.

California—The law regulates wages paid on all public works and will become effective Aug. 14. It provides that prevailing wages must be paid and that such wages must be stated in the call for bids. The penalty for failure to observe the law is a fine of $10 for each workman per day of violation.

Contractors, labor unions and awarding officials are all reported to be in favor of the law. State engineers claim the state will get better work because contractors will be forced to pay a fair wage scale and thereby will obtain a better class of workman.

Pennsylvania—The 1931 Pennsylvania legislature passed a law providing that the specifications for any public work shall, as far as possible, state the minimum wages that may be paid by the contractor. This law went into effect June 27. It does not state how prevailing rates of wages are to be ascertained.

New York—The New York labor laws provide that eight hours is a legal day's work and that wages to be paid for all public works and materials used in connection therewith shall be not less than the prevailing rate for a day's work in the same trade or occupation in the locality wherein the work is being performed. The law does not apply to employees engaged in the construction, maintenance and repairs of highways or waterworks construction outside the limits of cities and villages. The prevailing rate of wage is defined as that being paid to the majority of workmen in the same trade or occupation. In the event that there is not a majority in the same trade or occupation paid the same rate, then the rate paid the greater number shall be the prevailing rate, provided such greater number constitutes at least 40 per cent of the laborers. In case this greater number is less than 40 per cent of the total number, the average rate paid to such laborers shall be the prevailing rate. The prevailing rate of wages is not ascertained in advance by the awarding body, nor is it stated in the call for bids or specifications.

In addition to the regulations of the labor act, New York has recently passed the so-called Dunmore act, which extends the eight-hour provision and the prevailing wage provision of the labor law to grade-crossing elimination work, even through the contracts for such work are let by the railroad company.

Reports from New York indicate that there has been much confusion as to what are prevailing rates. In metropolitan areas, where the unions are well organized, the union scale is the prevailing scale. The prevailing rates are determined by the state only after a complaint has been made, and then an investigation is made by the industrial commissioner. Contractors are reported to be indifferent toward the law, but state engineers feel that it is an unwise piece of legislation, hard to enforce, and that it is difficult to determine what rates shall be paid. No delay to work has been reported.

New Jersey—The law of New Jersey enacted in 1913 applies to all public works construction by state or minor municipality and to all manufacturers in New Jersey by whom material is supplied for public works. Its primary requirement is that eight hours shall constitute a day's work. Secondarily it provides that "the prevailing rate of per-diem wages in the locality where the work is performed shall be paid." The penalty for violation is a fine ($50 to $500) or imprisonment for six months or both. Methods of determining prevailing wages are not defined, nor is it indicated that they shall be stated in calls for bids.

Nevada—The wage law of Nevada as amended reads: "On all public works carried on in the erection of public buildings by or for the state of Nevada, or by any individual, firm, company or corporation under contract with the state of Nevada, unskilled labor shall be paid for at a rate of not less than $4 per eight-hour day for each male person over the age of eighteen years who may be employed at such labor."

This act was approved March 13, 1929, and amends an act approved March 29, 1907. Although it specifically mentions public buildings, a ruling by the attorney general makes it effective on highway work also. The legislature of this year attempted to pass a bill making the minimum wage on public works $5 per day, but the bill failed of passage.

Ohio—The law approved April 23, 1931, applies to all public works, and respecting prevailing wage reads as follows: "Any public authority authorized to contract for a public improvement may, before advertising for

bids, nx and determine a fair rate of wages to be paid by the successful bidder to the employees in the various branches or classes of the work, which shall not be less than the prevailing rate of wages paid for each such branch or class in the locality (i.e., county—Editor) wherein the physical work upon such improvement is to be performed. The rate of wages so fixed shall be printed on the bidding blanks."

Violation is punishable by a fine of $50 to $500. Employees can recover the difference between prevailing wage and wage received. The director of highways, O. W. Merrell, and his assistants believe that the law will work out well for common laborers as a whole. The department has received complaints that laborers were being paid from 18 up to possibly 50c.; many contractors were paying 25 and 30c. The law went into effect July 27. The state architect believes it will work out fairly well in public building contracts.

Massachusetts—The law provides for an eight-hour day with certain exceptions, and is as follows with respect to wages: "The wages for a day's work paid to mechanics and teamsters employed in the construction of public works shall be not less than the customary and prevailing rate of wages for a day's work in the same trade or occupation in the locality where such public works are constructed. Any contractor who knowingly and wilfully violates this section shall be punished by a fine of not more than $100."

Steel Rail Developments

ALLOY and heat-treated steels are being used to an increasing extent in rail manufacture, largely in an endeavor to provide tougher and more reliable metal and thus to reduce the occurrence of defects in rails. At the same time careful records are being kept of rail failures in general and transverse-fissure failures in particular. These developments in rail manufacture and service are noted in the following condensed summary of the report presented by the rail committee at the annual meeting of the American Railway Engineering Association. —EDITOR.

RAIL PURCHASES during 1930 included about 273,000 tons of intermediate-manganese class, bringing the total of that class now in service to more than 650,000 tons. Reports of service results with this type of rail are generally favorable. The principal difficulty has been in a higher rate of horizontal and vertical split heads (both on curve and tangent track) than is usual with standard open-hearth rails. Interior transverse fissures are not numerous, and these, as well as wear, batter and chipping, are much lower than with the standard open-hearth rails. In general, the carbon and manganese content is quite high, though not segregated to any extent. Some porosity has been noted, and one report indicates the presence of martensite, with cracks originated in this hard substance. Thermal checks are prevalent, indicating the susceptibility of this steel to thermal conditions during the cooling process on the hot beds.

Studies indicate the desirability of lowering the specified carbon range by two or three points and the manganese range by five to ten points. By this means and by hot-bed protection, the horizontal and vertical split heads should be reduced considerably. Some roads have made these changes, and the 1930 specifications of the Canadian National Railway for intermediate manganese rails have carbon 0.50 to 0.65; manganese, 1.30 to 1.60; phosphorus, maximum 0.04; and sulphur, maximum 0.055. Its 1929 specifications required a minimum of 0.15 silicon, but in 1930 this was changed to a range of from 0.05 to 0.10 for some rails and a maximum of 0.05 in others. On the New York Central a study was made of the effect of silicon upon piping. Heats were taken with silicon as high as 0.30 without material increase in rejections for piping.

Heat-Treated Rails—Only 650 tons of heat-treated rails were laid during 1930. No failures of any type were reported for the 800 tons of rails which have been in track for nearly two years. This record is all the more remarkable from the fact that these rails are in about the most severe service on the various roads using them. Battering of ends, chipping and crosswise flow, particularly on the low side of curves, is much less for the heat-treated than for untreated rails. The treatment consists in immersing the rail heads in water for about half a minute and then equalizing the temperature in the quenched rail by immersion in a bath of molten lead, so that there is no risk of reducing the temperature to a degree where the steel would become brittle. From the lead bath the rail goes into the annealing furnace free from temperature differentials and internal stresses. The methods of treatment are improved from time to time.

Similar trouble with the quality of rail steel is reported from England, in regard to the heavier rails of the British standard sections, although these do not exceed 100 lb. per yard. Rapid wear of the rail heads seems to be the main complaint. Alloy steels are said to be far too expensive for consideration, but there is increasing use of medium (or intermediate) manganese steel and of heat treatment. The treatment is on the Sandberg sorbitic method with water quenching for the rail head.

Record and Transverse Fissures—Up to Jan. 31, 1930, the accumulated total of transverse-fissure rail failures reported was 44,035, an increase of 6,238 over the total in January, 1929, or an average rate of seventeen failures per day. This increase in number of fissured rails detected indicates not a greater prevalence of fissures but a greater ability to detect them.

Rail-Detector Car—The Sperry detector car, operated by the American Railway Association for the purpose of locating defective rails in track, has been in service two years and has tested 6,509 miles of track in 417 working days, or 15.6 miles per day. It located 1,682 defective rails, 567 having transverse or compound fissures, 345 horizontal fissures or horizontal split heads, 378 split heads, and 392 miscellaneous defects, including broken bases, split webs, pipes and broken rails. The average was a transverse or compound fissure rail per 11.5 miles of track inspected and a defective rail per 3.9 miles.

However, the general condition of rail in track cannot be gaged by these averages or by averages for individual roads, for the reason that the majority of fissures are found in rails from certain heats of steel which are particularly susceptible to this type of failure. As rails from given heats are laid as a rule more or less contiguously, the fissured rails from bad heats will be found in specific locations.

Old Irrigation Canal Replaced by Precast Concrete Pipe

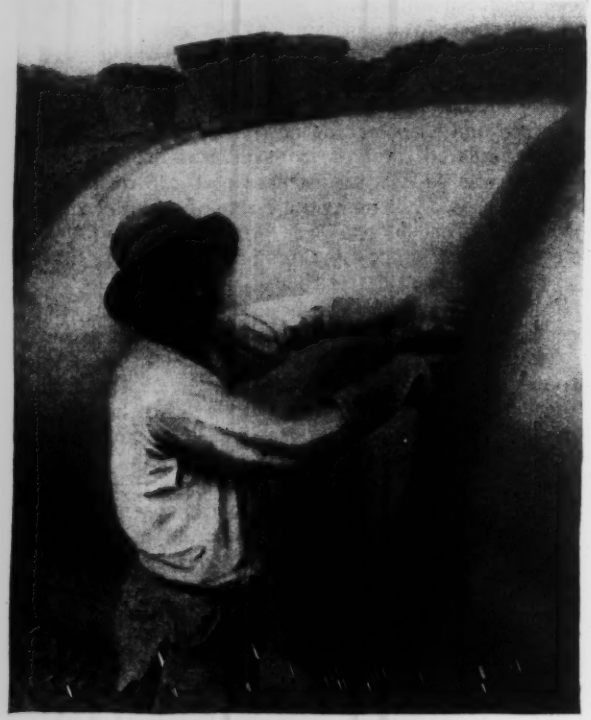
By H. H. KIDDER
Chief Engineer, Hidalgo County Water Improvement District No. 2, San Juan, Tex.

AN IRRIGATION pipe line of 72-in. precast reinforced-concrete pipe, 11,750 ft. long, replacing 18,550 ft. of canal, has recently been completed by the Hidalgo County Water Improvement District No. 2 at San Juan, Tex. The new line is part of a program of improvement of an old highly developed irrigation system of 70,000 acres in the Lower Rio Grande Valley of Texas. In addition to the 72-in. line the project includes 6¾ miles of 60-in. pipe and 3,250,000 sq.ft. of 2-in. reinforced-concrete canal lining.

The old canal supplied water to 10,000 acres in farming units of 5 to 40 acres each. Water service is on demand throughout the year with the most constant demand in the fall, winter and spring. The canal is in sandy soil, following a ridge and is entirely in fill, so that the adjacent borrowpits are always wet or filled with water. The improved character of the adjacent land prevented the securing of additional right-of-way. Use of the concrete pipe permitted the line to go directly across the depression, following the right-of-way of a smaller lateral. In addition to saving 6,800 ft. in length, it eliminated the serious construction difficulties expected if the old canal was to be lined with concrete. Estimates of construction cost also favored the construction of the pipe line, not counting costs of delays in the canal work.

The pipes were cast along the line of use in steel forms. A specially constructed portable plant placed the concrete in the forms, where it was tamped with pneumatic vibrators. One ring of steel-wire fabric was used, reinforcing the pipe for an internal pressure corresponding to a 15-ft. working head.

Six-ft. lengths of 72-in. pipe made at point of use



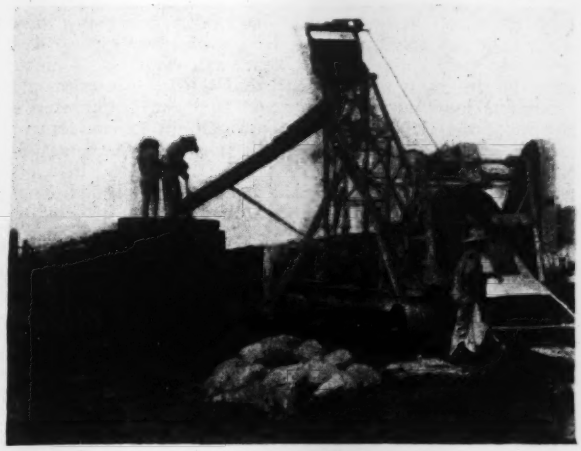
Outside bands made directly after pipe is laid

Inside banding delayed two or three weeks to allow stable conditions to develop.

The pipes were cast in 6-ft. lengths, with a wall thickness of 6 in., the thin-wall section commonly used in irrigation practice. The concrete mix was 1 : 4, closely controlled by a laboratory man to conform to the proper water-cement ratio to give a watertight dense concrete having a 28-day strength of 4,500 lb. per sq.in. The reinforcing fabric was formed into cylindrical cages on large bending rolls, and the lapping ends of the wire were spot-welded electrically. The pipe is reinforced against internal pressure only as the concrete shell has more than enough strength to support the external pressures to which it may be subjected.

Four large pneumatic vibrators were clamped around the middle of the steel form and started working as the concrete was placed. The placing was continuous, at the rated capacity of the mixer, with two men distributing the concrete evenly in the forms as it came from the chute. As the form became filled, the tongue-forming ring was placed over the form and finished by hand-spading. A crew of 25 men made fifteen lengths, or 90 ft. of pipe, each day. Each length of pipe contained 2¼ cu.yd. and weighed 9,000 lb..

A dragline excavator was used to dig the trench. Capable operators kept the bottom of the trench true to grade, assisted by a few men with shovels to smooth out the bucket marks and clean up the loose dirt. The pipes



Portable concrete plant for making precast pipe

were picked up from the edge of the trench where they had been made and lifted into place by a combination crane and dragline. Outside banding followed a short distance behind the pipe laying. Following the outside banding, earth was tamped by hand around the lower half of the pipe, and then the trench was completely backfilled. The crew of 37 men laid an average of 300 ft. of pipe per day. The inside joints of the line were sealed and banded some two or three weeks after the pipe had been laid and backfilled, after the settlement and expansion or contraction movements had taken place.

The entire work was done with the district's forces, using local labor and materials as far as possible. A. Van Dresar was the general manager, with the author as chief engineer.

LETTERS TO THE EDITOR

Wood Seats for Stadiums

Sir—The writer was greatly interested in the article "Wood Seats for Stadiums" in your April 30 issue and wishes to compliment the author, R. M. Wirka, of the Wisconsin Forest Products Laboratory, and *Engineering News-Record* for publishing this record of results, as we all know that the time test is the most valuable of all tests and the most difficult to secure.

In 1914, when the writer was supervising engineer in charge of the construction of the Yale Bowl, there was little such information to be had and it was necessary to rely largely on general engineering judgment, coupled with such data as could be found and supplemented by short time tests. It was decided that edgegrain wood should be used to avoid splintering, and the choice of Douglas fir rather than redwood (the only two woods in which such a large quantity of edgegrain could be obtained) was based on the fear that the redwood when wet might stain clothing, a point on which the results of experience would be valuable.

There are few if any worse exposures for protective coverings than that of the paint on stadium seats, and short time tests were made in the Bowl on eighteen seats with various oils and varnishes; within a period of about two months all showed signs of failure except chinawood oil and a couple of the higher grade spar varnishes, and the chinawood oil was chosen as being apparently as good as any of the varnishes and cheaper. It was recognized that paint would give better protection than any of the varnishes, but the wood was so beautiful that it seemed a shame to cover it up. The writer's experience on the Yale Bowl convinced him of the futility of attempting to use a transparent coating, and on subsequent stadiums that he has designed he has always used a high-grade deck paint, which has proved reasonably satisfactory, although as Mr. Wirka states a new coat should be given every year. This is needed, however, only on the top side, as the paint on the edges and bottom lasts much longer.

In regard to the seat supports and fastenings, the Yale Bowl was the first within the writer's knowledge to use wood seats supported on metal, set on the edge of the concrete step, his idea in this being to get greater protection against decay of the wood and greater cleanability of the stadium. The seats were secured by lag screws from beneath, and it is gratifying to note that all of these innovations have been approved by the time test. Sloping the seats to the rear is a valuable point not only for drainage but also for comfort, and has always been used by the writer.

T. C. Atwood,
Atwood & Weeks, Inc.,
Architects and Engineers.

Chapel Hill, N. C.,
May 23, 1931.

Cooperative Industrial Research

Sir—I was interested in the editorial in your July 23 issue in which the writer points out very well the essential factors involved in cooperative industrial research.

The iron and steel industry in this country has gone so far without any cooperative research work to speak of that it is difficult for some executives to appreciate the possibilities of such work. It is essential to other industries and has become an integral part of the steel industry of Germany and some other countries in Europe.

In stating the problem in my paper for the American Iron and Steel Institute, you will not—page 19—that some consideration was given to the importance of cooperating on customers' problems, so as to obtain through this contact a better understanding of each other's problems and a mutual confidence one with the other.

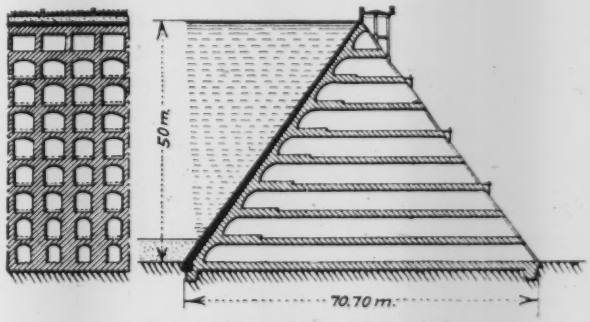
F. N. Speller,
Director, Department of Metallurgy and Research,
National Tube Co.

Pittsburgh, Pa.,
July 27, 1931.

Cellular Dams Patented in 1912

Sir—In the issue of April 30, 1931, a new type of dam is proposed by C. E. Grunsky, under the heading "Honeycomb Gravity Dam Proposed." It seems that perhaps Mr. Grunsky is not aware of the fact that a dam of this character was patented by the firm Brüder Redlich und Berger, Vienna, in 1912. The publication "Der Standsichere Mauerdamm" (The Stable Masonry Dam), published by Franz Deuticke, Vienna and Leipzig, contains a number of similar proposals, one of which I state herewith (Fig. 1).

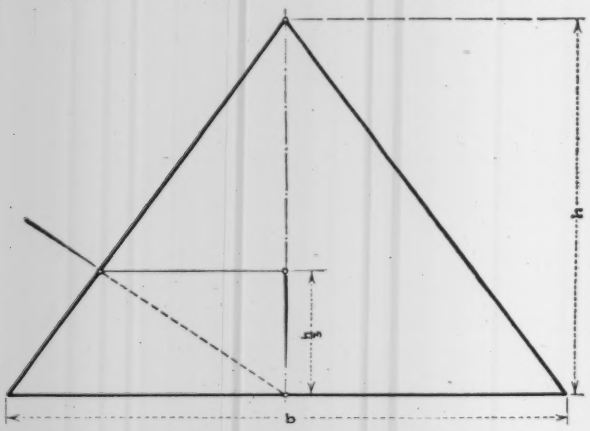
This proposal is based on the fact that with both empty and full reservoirs, in all horizontal sections, as well as at the base, a uniform distribution of the normal stresses and ground pressures has been obtained—in other words, the line of pressure runs as a central line. The profile meeting the above conditions is a symmetrical triangle



German design for a cellular dam

(Fig. 2) of such slopes that the centroid of the water pressure with the reservoir full passes through the center of the base. This requires the base to be greater than the height in the ratio $\sqrt{2}$, or 1.41, as may easily be shown.

This ratio does not involve the specific gravity of the masonry, so that the condition of a uniform ground pressure



Forces acting on a dam of symmetrical triangle section

may be obtained with any lightweight masonry. This fact invites the provision of hollows in the dam in order to save concrete. But I beg to point to the fact that this and other suggestions have up to the present not been taken up in actual practice, because the savings of concrete have been exceeded by the increased cost of forms and more careful workmanship in view of the greater stresses. The profile shown is better applicable to dams of dry masonry—that is, for dams in which bricks or stones of different size are placed by hand so as to secure a minimum of hollows.

Dr. Ing. N. Kelen,
Privatdozent at the Technical High School, Berlin-Charlottenburg.

Berlin, Germany,
June 2, 1931.

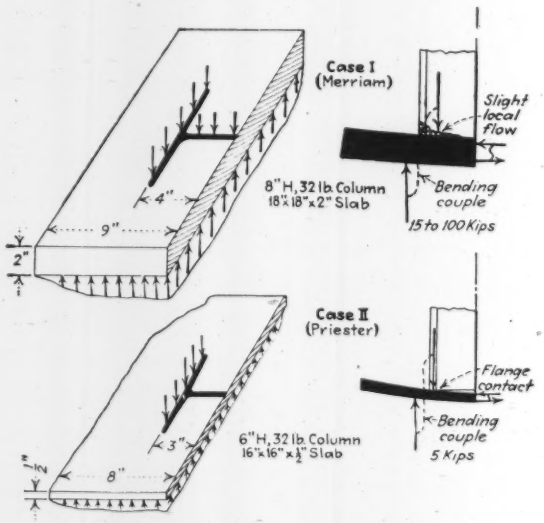
Steel Slabs for Column Bases

Sir—In *Engineering News-Record*, March 19, 1931, p. 482, appeared an article on steel slabs for column bases by Prof. George C. Priester, in which it was stated that tests he had made showed that the slab bends most about the axis perpendicular to the web of the column and that this appeared to be in contradiction to the findings of the writer, as reported in your Nov. 21, 1929, issue, p. 811. (See also "Design of Steel Column Slabs," published by the American Institute of Steel Construction, 1929.) It was also stated that the fact that the foundations in the tests of the writer had different properties from the foundations described in Prof. Priester's paper might, in part, account for the contradiction.

For convenience, let the writer's investigation be known as Case I and that of Prof. Priester as Case II. Referring to the diagram accompanying these remarks, we find that whereas Case I deals with a steel slab of conventional dimensions (area-thickness ratio = 162), Case II deals with a thin plate (area-thickness ratio = 512), which would be neither sufficiently strong nor sufficiently rigid to distribute the full column load with satisfactory uniformity over a footing. In other words, the Case II specimen does not satisfy the fundamental requirement of a column base plate, and hence conclusions arrived at from its use are subject to error.

Both investigations were based on the same technique—namely, analysis of contour plots obtained by strain measurements. Since the deflection of such flexure members may be expected to vary approximately inversely as the cube of their depths, the plate deformations in Case II (for a given bending moment) might be 50 times the slab deformations in Case I. This may explain why the load was found to be concentrated on the column flanges in Case II, whereas in Case I the slab was so rigid that the end of the column was able to conform to the shape of the slightly deformed slab and the load was uniformly distributed over the column area. In abstract analysis of this action, it is very important to appreciate that for a thick slab the deformations are so small that sensitive instruments are required for their detection and that the slight elastic distortion of the slab will permit the column to conform to the shape of the slab surface without gross plastic action anywhere.

In the Case I investigation a specially designed sand base was used. It was adopted after a great deal of thought



Comparative dimensions and loadings of two test series of steel slab column bases

and effort had been devoted to the matter. Concrete, wood grillage and other forms of support were rejected, for reasons that are evidently not commonly appreciated. These reasons are as follows:

1. A properly designed Ottawa sand base will produce a condition more closely approximating uniform upward load distribution than can be obtained with other types of support.
2. This uniform distribution of upward load has been commonly used as a design assumption in the past because
3. The uniform distribution is the limiting (most unfavorable) distribution. Any other type of load variation will cause less bending in the slab.
4. A slab designed to resist the maximum bending moment set up by the uniformly distributed upward load assumed will generally have an area-thickness ratio of less than 200, which means automatically that the slab will be rigid and capable of spreading out the load over the footing with satisfactory uniformity. Just how much variation from absolute uniformity of load distribution occurs with, say, a concrete footing and a thick slab is not known. It is to be regretted that the Case II investigation did not deal with a slab of conventional size, for then some light might have been thrown on this important detail.

By alluding to the above points, the writer has sought to defend his position in regard to the conclusion that for steel slabs of conventional thickness the load exerted on the slab by the column may be regarded as being uniformly distributed over the column area. Based upon this conclusion, the following proposal may be made: For the case of the H-column, why not mill away a slight amount of material from the web of the column, so as to insure that all the load will be carried by the flanges? Mechanics analysis shows that the bearing pressures would not be excessive and that the bending moment in the slab, for a given column load, would be reduced. Perhaps some reader may be interested to investigate the soundness of this proposal by laboratory test.

Kenneth G. Merriam,
Assistant Professor of Applied Mechanics, Worcester Polytechnic Institute

Worcester, Mass.,
July 2, 1931.

NEWS OF THE WEEK

Yangtse River, China, Near Record Flood

In a telegram dated July 28 the American consul general at Hankow, China, reported that the level of the Yangtse River at Hankow is 49 ft. 9 in., within 9 in. of the high record of 1870; that the river is still rising; that despite barricades along the waterfront many of the streets of Hankow are already flooded by river water; that the city is protected on the north and the east by a dike; and that the state of this dike is causing considerable anxiety with regard to the safety of about 100 square miles of low lying territory including certain sections of Hankow. On July 29, according to a subsequent report, the embankment of the Hankow-Peiping Railway broke at a point 26 miles down river from Hankow, flooding an area of some 30 square miles including many Chinese villages and an important foreign residential area.

Salt Lake City Gets More Water

An important step in the program of augmenting the water supply of Salt Lak City, Utah, was completed on July 16 when water from a group of artesian wells located in the southeast section of the city was turned into the new artesian pipe line. One unit of the 30 sec.-ft. pumphouse was placed in operation, adding 7 sec.-ft. to the municipal supply system. As the collection system is extended in the artesian basin the volume will increase. On July 28 the last major addition of potable water to the city's supply was made when 7 sec.ft. of new water was turned into the new Little Cottonwood conduit.

With the completion of these two major projects approximately 15,000,000 gal. of water daily have been added to the city's water supply. Smaller additions will also be made through various sources. Completion of the Little Cottonwood conduit is six days ahead of the contract deadline and has left storage reservoirs in far better condition than water department engineers expected.

Los Angeles Makes Power Bond Payments in Advance

For the first time in the history of the Los Angeles Department of Water and Power, its power bond interest and redemption charges will be paid in advance. The Board of Water and Power Commissioners this week authorized advance payment of $3,000,000 for power bond charges in 1931-32. Interest earnings of $40,000 will accrue by making the advance payment instead periodically, as heretofore. After the $3,000,000 payment, the department will have $2,000,000 in cash still on hand and accumulating at the rate of $600,000 a month.

Date Set for Golden Gate Bridge Bond Suit

Hearing of the test suit before the State Supreme Court of California to determine the power of the Golden Gate Bridge Highway District to levy taxes to make up deficits in operating expenses should the tolls of the bridge be insufficient has been set for Sept. 15. The date for the hearing was set in an alternative writ of mandate signed by Chief Justice William H. Waste. A conditional bid on the $6,000,000 worth of the $35,000,000 bond issue and optional contracts have been arranged for pending the decision in this test suit.

Permission Granted to Form Atlanta Drainage District

Relief in the near future of stream pollution by the city of Atlanta, Ga., and its suburbs has become possible by the passage last week by the Georgia state legislature of an act authorizing the creation of the necessary drainage district and also providing for an election to pass on a $13,000,000 bond issue to finance the required works. Construction of sewage disposal works for Atlanta and its invirons has not kept pace with their rapid growth in population and damage suits are threatened by communities on streams below unless steps are taken promptly to relieve the situation. Passage of the enabling act is the first required step. It is, however, by no means certain that this act will become effective. The proposed bond issue totals nearly as much as the present municipal bonded indebtedness of the territory to be included in the proposed district.

Workmen Break European Tunneling Record

Sixty men employed on the Manchester Corporation waterworks project at Hawkeswater have in a 5½-day week broken the European tunnel-boring record. Working continuously in gangs of twenty, they accomplished the following feats in the times mentioned:

Advanced the tunnel 180 ft., thereby breaking the previous record of 163 ft. created by the men engaged last year on the Halkyn tunnel, North Wales; removed more than 1,000 tons of solid rock from an aperture about 7 ft. wide and 7 ft. high; fired twenty rounds of explosives, by which they advanced at the rate of 8 ft. per round.

The company employing the men intends to award a gold medal to each. The tunnel is cut out of solid rock.

RAILS OF THE GREAT NORTHERN ENTER CALIFORNIA

Just a few days ago the giant track laying machine shown in this illustration brought the Great Northern Railroad into California for the first time. This road and the Western Pacific are spending $15,000,000 on a 200-mile line which will link the northern tier of states directly with San Francisco. The machine, which will lay nearly two miles of track daily, is equipped with mechanical carriers which convey ties on one side and rails on the other from flat cars at the rear to the end of track, where they drop in place as workmen drive the spikes with pneumatic hammers. The line will be completed this year.

Materials Testing Meeting to Be Held in Zurich

To promote the international exchange of ideas in the field of material testing, the first international congress of the New International Association for Testing Materials will be held in Zurich, Switzerland, Sept. 6-12, 1931. In order to avoid too wide a dispersion of work a definite selection of questions to be presented has been made. Activities have been divided into four major divisions, as follows: Metals, non-metallic inorganic materials, organic materials and questions of general importance. The American representative of the association is W. H. Fulweiler, American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa.

Openings for City Planners in United States Service

The U. S. Civil Service Commission announces an open competitive examination for the position of city planner to fill vacancies under the National Capital Park and Planning Commission, Washington, D. C. The entrance salary is $4,600 a year. Competitors will not be required to report for examination at any place, but will be rated on their education and experience and on their published writings, reports or a thesis. Applicants must have been graduated from a college or university of recognized standing, with major work in architecture, civil engineering or landscape architecture, and must have had at least two years' experience in city planning. Certain additional experience is also required. Applications must be on file with the U. S. Civil Service Commission at Washington not later than Aug. 14.

I.C.C. Acts on Western Railroad Extensions

The Great Northern Railway has been authorized by the Interstate Commerce Commission to relocate a portion of its line in Deschutes County, Oregon, that will have to bear heavier traffic upon completion of the line from Klamath Falls, Ore., to Bieber, Calif. The new cut-off, extending from Bend south to Lava, 14.3 miles, will permit the Great Northern to suspend operation over the present line between these points, which was originally built as a logging road and is not up to main-line specifications. The cost of the project is estimated at $897,400, of which $175,000 is for terminals at Bend. The line will be single track, laid with 90-lb. rail.

The commission has again denied the application of the Sacramento Northern Railway to construct an extension of its Holland line from the south boundary of Yolo County, Calif., 8.3 miles to Ryde, on Grand Island. The extension would serve a rich section of the Sacramento River valley but the Commission has affirmed a previous finding that construction of a $735,000 line which would depend almost wholly upon business diverted from the Walnut Grove branch of the Southern Pacific would be economically wasteful.

New Orleans to Galveston Canal Possible Within Three Years

Completion of the intracoastal canal from New Orleans to Galveston Bay and possibly to Corpus Christi, Tex., within three years seems assured, according to Roy Miller, active vice-president of the Intracoastal Canal Association of Louisiana and Texas.

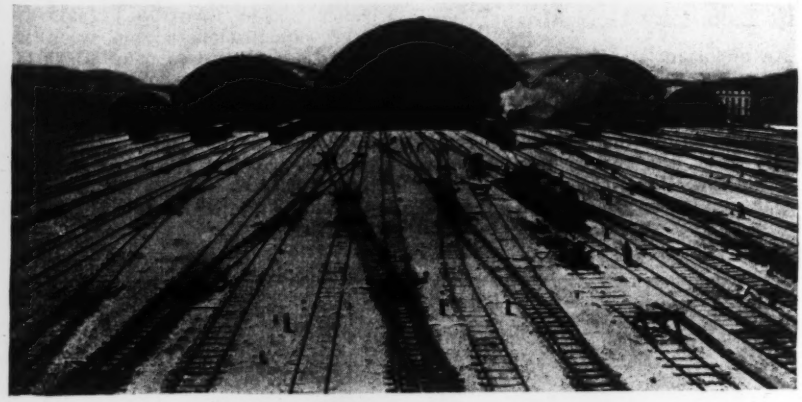
On the New Orleans-Morgan City, La., link, the contract has been let for the construction of locks at Harvey, opposite New Orleans, where the canal touches the Mississippi River. Bids have been asked on dredging work in Terrebonne Parish and all rights-of-way have been secured in Jefferson and Lafourche parishes, with the advertisement for bids on construction work expected shortly.

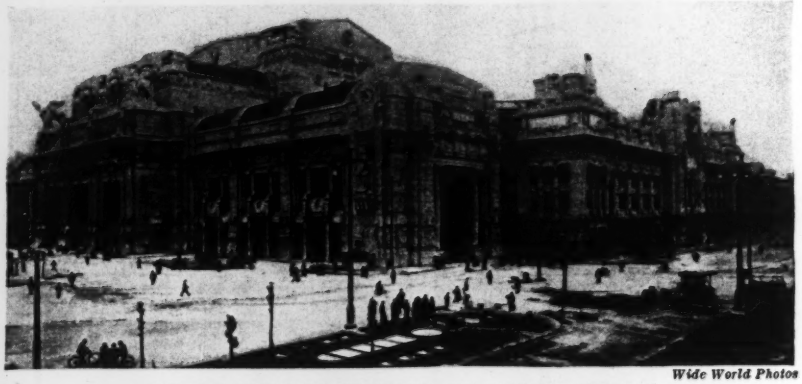
The entire stretch of the canal from Plaquemine to the Sabine district in Texas via Morgan City is now under contract and completion to Texas within two years is expected, according to Mr. Miller. At Plaquemine the canal will also touch the Mississippi. The Harvey route from New Orleans and the Plaquemine route will meet at Morgan City and continue as one body to Texas.

Contract for the construction of the canal from Port Arthur, Tex., through Jefferson and Chambers counties has been let and work will begin shortly. Specifications for dredging along Bolivar Peninsula in Galveston County have been approved and bids for the work will be asked soon.

Every effort is being made to complete right-of-way work between Galveston and Corpus Christi and in view of favorable physical conditions, Mr. Miller believes that it is probable that the waterway can be completed to Corpus Christi within three years.

Mr. Miller also points out that the survey ordered by the Chief of Engineers on the link from Corpus Christi to the Rio Grande Valley now is under way and that it is hoped the result of this survey will be the authorization by Congress of the completion of the canal to the Rio Grande Valley.





Wide World Photos

NEW RAILWAY STATION AT MILAN, ITALY

The new station in Milan, Italy, for which the cornerstone was laid 25 years ago, was recently officially opened. In the upper view are shown the five steel arches that form the trainshed, which is nearly 1,200 ft. long. A central arch of 240 ft. clear span is flanked by two of 150 ft. and two of 40 ft. Below is shown the exterior of the station. A description of the station was given in *Engineering News-Record*, May 15, 1930, p. 803.

Drainage Project for Nile Delta

With the object of reclaiming the lands of the Nile delta at present unsuitable for agriculture because of the high salinity of the soil, the Egyptian government has recently undertaken a vast drainage project. These lands lie in a belt about 100 miles wide from east to west and from 10 to 25 miles in depth, stretching across the northern part of the delta from Alexandria to Port Said.

The reclamation is to be carried out by an irrigation canal system that will flood the salt lands with fresh Nile water, which will percolate through the soil and ultimately find its way, carrying with it the salt in solution, to a system of drains cut at a slightly lower level than the canals, which will discharge into Burullus, Mensala and Edku lakes, or directly into the sea. Because of the configuration of the delta land, this washing and draining process, to a certain extent, can be carried out naturally by gravity, but would be accelerated if the level in the drains were lowered by even a few feet. High capacity low lift pumping stations are therefore to be installed near the outlets of the drains in order to lower the water level. These pumping stations, of which there are to be fifteen, will be electrically driven, power coming from three generating stations at present under construction at Aft, Belqas and Seru.

San Francisco-Oakland Bridge Project Speeded by Legislation

Substantial progress toward active work on the proposed San Francisco-Oakland bridge across San Francisco Bay was accomplished by legislation passed by the 1931 California legislature. The structure will be built by the state Toll Bridge Authority, created by the 1929 legislature. A group of three bills provided: (1) a $650,000 loan from the state funds for preliminary work; (2) adoption of the bridge as part of the state highway system, which will provide for maintenance of the structure, and (3) amendments to the state Toll Bridge Authority act to make the revenue bonds more salable. As the result of advance of funds, a substantial designing organization will be set up at once under the engineering department of the California division of highways. Preliminary field work, now in progress, will be pushed after Aug. 15, when the $650,000 becomes available.

The appropriation of money from the state's general fund for use of the Toll Bridge Authority is primarily to facilitate early work on the project. In addition, it is an expression of confidence on the part of the state which will have a bearing on the sale of bonds. This money is to be returned to the state with 4 per cent interest out of the first sale of bonds.

The bill under which "the state department of public works may, for the purpose of maintenance only, accept and adopt such highway crossing as a state highway" indicates that should the income from tolls be insufficient for maintenance it is assumed the state could then use highway funds for ordinary physical maintenance. Under the original act, maintenance of the bridge would have been from tolls. The term "maintenance" is not interpreted, according to report, as meaning assistance in carrying interest or financing charges.

The important amendments to the original Toll Bridge Authority act are two: (1) The Toll Bridge Authority may appoint the state highway engineer to serve as its chief engineer in addition to his regular duties, and (2) bonds authorized by the act may be sold below par but not for less than a sum to net the purchaser 6 per cent. According to the original act the bonds were not to be sold below par.

Col. Sultan Given Medal of Distinction by Nicaragua

Lieut. Col. Dan I. Sultan, Corps of Engineers, in charge of the Nicaragua Canal survey, has been presented with a medal of distinction by the Republic of Nicaragua. The citation accompanying the medal follows:

> The President of the Republic of Nicaragua takes great pleasure in presenting the Nicaraguan Medal of Distinction to Lieut. Col. Dan I. Sultan, Corps of Engineers, United States Army, for service in Nicaragua, as set forth in the following citation: "With the approval of the Nicaraguan government Lieut.-Col. Dan I. Sultan, Corps of Engineers, United States Army, came to Nicaragua in August, 1929, with 25 officers and 250 enlisted men of the United States Army Engineers for the purpose of making a survey and study of an interoceanic canal across the Republic of Nicaragua. For two years intensive work has been carried on under very trying conditions to North Americans. With remarkable engineering skill, sound judgment and untiring energy, he has brought to a successful conclusion the survey and studies for this gigantic engineering project that, when constructed, will mean so much to the prosperity and future growth of Nicaragua. Col. Sultan's services have been invaluable, sincere and loyal to the Republic of Nicaragua and for this distinguished service he is awarded the Nicaraguan Medal of Distinction."

Plan for Regrading Bunker Hill in Los Angeles

A detailed plan for the regrading of Bunker Hill, extending from First to Fifth St. between Hill and Flower Sts., Los Angeles, Calif., has been presented to city and county officials by Henry A. Babcock, representing William H. Babcock & Sons, of Chicago, real estate consultants, economists and valuators engaged to make an economic survey of the proposed project. The Bunker Hill area is in the Los Angeles downtown section and is regarded as a major barrier to east and west traffic and to expansion of the downtown area. The estimated cost of the project is $24,000,000 if done with public funds or $27,000,000 if done as a private enterprise. The plan submitted suggests the acquisition of land by the city or county, or both. Buildings in the area would be wrecked and the ground regraded.

Hoover Dam Notes

The high temperatures continued during the week ended July 28 to slow down the work being done in connection with the Hoover Dam project. While exact figures are not given, the report says "a considerable number of employees were stricken with heat prostration and several deaths resulted." Continuing the official report says: "These prostrations have lowered the morale of the entire contractors organization. Practically all fatalities have been among the employees in the canyon and not at Boulder City." The area enclosed by the forms at the pre-sedimentation basin registered a maximum temperature of 140 deg. The heat was such as to delay the delivery of sand and gravel because of the difficulty of keeping crews on the job. The water system likewise has been delayed due to the large labor turnover. For two weeks prior to the issuance of the report it had been practically impossible to maintain crews in the trench being dug for the water system.

Breaking of cylinders in the concrete investigations at Las Vegas showed strengths higher than had been anticipated. The breaking of 28-day cylinders using pre-mixed cement with a maximum of 4½-hour age before mixing show better results than were given at 7-day age. Four and one-half hour premixed cement gave strengths of over 50 per cent higher than the ordinary immediate-mixed cement.

Tests are being made at Fort Collins of the Stoney gate type of spillway. It is now planned to make another model spillway of the overflow type with an uncontrolled crest. At Montrose tests are being made on a drum gate type of spillway. A scale flow of 160,000 sec.ft. is being used. A blower is being installed in tunnel No. 2 from the Nevada adit. Wider gage tracks are being installed for the mucking machines.

Progress on the Arizona inner tunnel as of July 25 was 320 ft.; on the Arizona adit, 602 ft.; on the upstream drift from the adit, 160 ft.; downstream drift, 210 ft. The heading at the outlet of the inner Nevada tunnel had progressed 118 ft.

The New Mexico Construction Co. has been awarded the contract covering certain street improvements. Bids will be opened for the administration, dormitory and municipal buildings, on Aug. 10. Machinery is being installed in pumphouse No. 1. Advertisements will be issued Aug. 15 for the water treating plant and for the sewage system. Lightning arresters have been installed at the Hoover Dam substation, where the wiring is practically complete. Wiring of both pumping plants is in progress. The lighting system has been installed at survey camp No. 1.

All rough grading on the Boulder City-Hoover Dam Railroad was to have been completed Aug. 1, except the heavy fills at stations 410 and 425. Construction of tunnel No. 5 is proving very difficult; the entire 350 ft. of the tunnel will have to be full timbered.

New Water Commissioner Named for St. Louis

Leonard A. Day, water commissioner of St. Louis, Mo., since 1926, was discharged from that position on July 18. J. L. Rilliet, who has been chief engineer of light, heat and power, was named as his successor by John C. Pritchard, director of public utilities.

Mr. Day was made water commissioner five years ago by Mr. Pritchard during his earlier occupancy of the position of director of public utilities. When Mr. Pritchard was suspended by the mayor two years ago in connection with an investigation concerning some lighting contracts, Mr. Rilliet was appointed by the mayor to fill the vacancy. The charges against Mr. Pritchard were recently dismissed and he was reappointed to his previous position, Mr. Rilliet stepping aside.

Engineering Council Takes Stand on Topographic Mapping

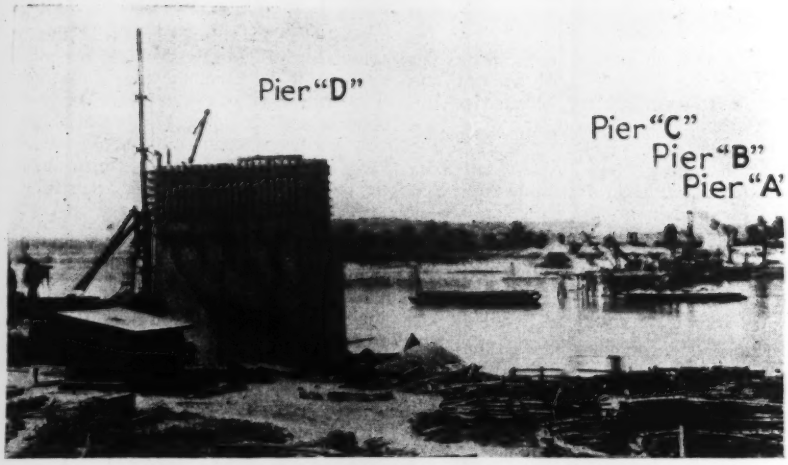
Engineering Council announces that it will work for "the removal of restrictive clauses in the appropriation bills which hinder or defeat the Temple act of 1925," providing for the completion of the topographic mapping of the United States within twenty years. The present 50-50 arrangement between the federal government and the states is resulting in injustice, and every state, it is held, should have topographic mapping done within its borders.

Staggered Hours Speed Traffic in San Francisco

Since the inauguration of the staggered system for rush-hour traffic, San Francisco has accomplished an expansion of 12 per cent in the capacity of its downtown street and traffic system without any cost. The operation of this plan in San Francisco is being studied by the city of Los Angeles, and at a recent meeting in Los Angeles a committee of twenty members called the Rush Hour Traffic Committee was appointed to study the possibilities of such a plan for that city.

There are 153 non-retail firms in San Francisco employing 10,000 persons in the central business district now operating under the rush-hour plan. Its operation has increased street car speed 12 per cent, with a corresponding increased freedom of automobile traffic flow. Besides assisting human traffic, it has made possible more rapid pick-up and forwarding of express packages and has been a great relief to the post office department.

Further campaigning will be carried on by the traffic committee in order to obtain a shift in hours of a total of 15,000 persons, which would mean a reduction of 25 per cent in the volume of street traffic and is the figure set as the necessary reduction for San Francisco.



EVANSVILLE BRIDGE PIERS NEAR COMPLETION

The new highway bridge being built jointly by the states of Indiana and Kentucky across the Ohio River near Evansville, Ind., is rapidly approaching the stage where superstructure erection can begin. The five main piers, being constructed by the pneumatic process, are approaching completion. These require the removal of about 16,000 cu.yd. of sand, gravel and rock and the placing of about 28,000 cu.yd. of concrete. Three caissons have been sealed, the fourth will be landed within the next two weeks, and the last by Sept. 1. According to the Kansas City Bridge Co., which has this main substructure contract, all of this work will be completed during the first part of October. All piers are being carried to rock, requiring air pressure of from 35 to 45 lb. per sq.in. Caissons for the three river piers are 24x72 ft., and for the two land piers 15x60 ft.

Wage Troubles in Illinois

Complaints that contractors are not paying union rates and are importing labor from other sections has led to action by the unions in Lake County, Ill., in calling off men from road and building construction. The non-union men quit work without making any resistance. Complaints are being made also that in advertising for bridge work over the Illinois waterway, the "prevailing rates of wages" given are below those actually prevailing in the neighborhood. Conferences are to be held between the State Waterway Division, State Highway Division and labor union officers.

Contract for Naval Ammunition Depot in Hawaii

The navy department has awarded a contract totaling $2,030,445 for the construction of the major part of a new naval ammunition depot on the Island of Oahu, Hawaii, to the Thomas Haverty Co., of Los Angeles, Calif. The new depot will comprise a waterfront shipping depot at West Loch, Pearl Harbor, and a storage depot at Lualualei, with rail and road connections between the two depots. The contract includes the construction of 135 buildings, 12 miles of railroads and 15 miles of paved roads, together with water, sewer, drainage and electrical systems. A concrete pier at West Loch will be built by the public-works force at Pearl Harbor, and a number of other contracts will provide for dredging, fences and other projects required to complete the depot. Active work is expected to start before the end of July, and the station will be completed July 1, 1933.

San Francisco Studying Plans For Bridge Approaches

The San Francisco Traffic Survey Committee, as the result of an official request from the City Planning Commission, is preparing a series of basic traffic studies looking toward the design of suitable traffic facilities to provide for the traffic and transportation loads to be created by the proposed transbay and Golden Gate bridges. Dr. Miller McClintock, director of the Traffic Survey Committee, will have general charge of this work. The plan will include recommendations for adequate approach ways to the bridges and for major traffic arteries essential within the city in order that the full potential benefits of the bridges may not be limited through avoidable restrictions in traffic circulation within the city.

Chicago Cuts $12,000,000 From Paving Program

Since special assessments for street paving would be a heavy burden on many Chicago taxpayers already pressed by high taxes and reduced incomes, the Board of Local Improvements has abandoned 159 paving projects estimated to cost $12,184,000, or nearly 20 per cent of the total program.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Federal Aid in Unemployment Relief Advocated—Output of Timber Must be Cut 50 Per Cent

WITH THE CERTAINTY that there will be a large amount of unemployment again this winter, few believe that it will be possible to avoid the direct use of public funds for relief. Private charity will not be forthcoming in sufficient volume to meet the situation, it is apparent. There is reason to believe that, among those who would be the most liberal contributors to a voluntary fund, many prefer the use of public funds so that the burden can be distributed better.

Because of the very satisfactory way in which the states and the central government have cooperated in the construction of highways, there is support for a plan using the federal-aid principle. Any money appropriated by the United States for relief would be matched dollar for dollar by the states. The theory of this plan is that it will place enough of the burden on the local interests that they will be interested in seeing that help is extended only to those who need it imperatively.

Any funds that may be voted for relief will be provided by borrowing. A very definite attitude against increased taxes has been assumed in Washington on the theory that future prosperity should carry the burden of the present depression. None disputes that provision for depressions should be made in advance, but since that was not done, the only thing left to do is to increase indebtedness and pay it off when times are better.

Irrigation Development Halted

As a result of the renewed emphasis that is being placed on governmental economy, the Bureau of Reclamation has reaffirmed its statement of policy that no further irrigation projects will be undertaken for some years. There has been some disposition on the part of critics of reclamation work to question the advisability of extending irrigation projects in the face of crop overproduction. Officials of the Reclamation Bureau, however, are not motivated by such criticism in deciding that they will not undertake new projects. A study of the crops raised by irrigation has shown that they do not consist of surplus products. It has also been shown that the crops raised on irrigation projects offer practically no competition to other agricultural sections, since they are usually of a different variety.

Depletion of the reclamation fund is primarily responsible for the decision of the Reclamation Bureau to forego any new work. This fund is made up of repayments of Federal funds used to finance irrigation projects, certain funds from the sale of public lands, and royalties from oil wells in public lands. The conservation policy adopted by the administration in respect to the public lands has seriously reduced the income from this source. In addition, prevailing economic conditions have made it necessary to extend over greater periods the repayment of Federal funds from some of the previous projects.

Railroads Propose Crossing Over Bonnet Carré

Engineers for the railroad lines which cross the Bonnet Carré spillway near New Orleans have submitted to the chief of engineers a proposal looking to settlement out of court of the damages occasioned by the construction of the spillway. The proposal of the railroads have not been made public, but it is understood to provide for heavier structures than the army engineers think necessary. It is of significance, however, that an agreement has been reached for the construction of a double track bridge to be used by the lines jointly when the spillway is in use. At other times they will continue to use their regular low level tracks on the floor of the spillway. At the time of this writing there seems to be no early prospect of agreement.

Fixed Wiers for Flood Control

That General Lytle Brown, the chief of engineers, will recommend an alteration in the Jadwin flood control plan under which the fuse plug levees will be supplanted by fixed concrete wiers seems probable. As the studies progress on the diversions from the west bank of the Mississippi River, General Brown sees additional proof of the practicability of the idea. The wiers which would supplant the fuse plug levees would be very much like the wier at the head of the Bonnet Carré spillway except that they would be much longer. In the center of the wier needles would be used, just as at Bonnet Carré, for a distance of 4,000 or 5,000 ft. It is believed that it would take a movable section of that length to secure the full power of the river in widening the floodway. The plan is to dredge a pilot channel 30 ft. deep and 100 or 200 ft. wide through the lowest portion of the Boeuf-Atchafalaya basins. By allowing the water to run through this cut whenever the river exceeds a bank-full stage the initial channel gradually would be widened until it could take care of a large flood.

Drastic Cut in Lumber Production Advised

Curtailment of lumber production by 50 per cent during the second half of 1931 has been recommended by a special timber survey committee appointed by Secretary Lamont. The committee would limit "reasonable" production to 6,476 million feet during the remainder of the current year. This is half the present rate of production and one-third of the output in the last 6 months of 1930. The balance of anticipated consumption, estimated at a total of 9,014 million feet, would be drawn from excess stocks and imports. Stocks now totalling 10,129 million feet would be reduced by 2,173 million, equivalent to one-half of the present excess over "reasonable" stocks, which the committee puts at 5,783 million.

Because of the critical condition of the domestic industry, the committee urges that moderation of imports should be coupled with curtailment of output. Regional allocations of output suggested for the last half of the year conform to the present ratios of regional to total production.

In submitting its report to Secretary Lamont, Chairman of the U. S. Timber Conservation Board, the Committee declared that the adverse conditions of the lumber industry as a whole have reached a degree of instability and insecurity sufficiently acute to justify extraordinary corrective measures. Stocks and additional production are factors which, according to the committee, are directly controllable by the individual companies.

SOCIETY CALENDAR

AMERICAN ASSOCIATION OF ENGINEERS, Chicago; annual convention, Huntington, W. Va., Sept. 28-30.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington; annual meeting, Sept. 28-Oct. 1, Salt Lake City.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York; annual convention, Montreal, Sept. 14-17.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; fall meeting, St. Paul, Minn., Oct. 7-9.

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS, St. Louis; meeting, Oct. 19-26, Pittsburgh.

AMERICAN WELDING SOCIETY, New York City; fall meeting, Sept. 21-25, Boston.

INTERNATIONAL CITY MANAGERS ASSOCIATION, Chicago; annual meeting, Oct. 7-10, Louisville, Ky.

INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, Chicago; conference, Sept. 24-26, New York City.

NATIONAL MUNICIPAL LEAGUE, New York City; annual meeting, Nov. 9-11, Buffalo, N. Y.

NATIONAL SAFETY COUNCIL, New York City; twentieth annual safety congress, Chicago, Oct. 12-16.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston; annual convention, Sept. 29-Oct. 2, Boston.

CONCRETE REINFORCING STEEL INSTITUTE, Chicago, Ill., will hold its semi-annual meeting Sept. 28-30 at Buckwood Inn, Shawnee-on-Delaware, Pa.

Personal Notes

BRINDSLEY SHERIDAN, who has been connected with the New York State Highway Department at Oswego, N. Y., is now with the Metropolitan Park Commission at Boston, Mass. Mr. Sheridan is a graduate of Northwestern University.

W. S. VROOMAN, formerly assistant engineer with the sanitary engineering department of Grand Rapids, Mich., is now stationed at Deer Lodge, Mont., as manager of the Commonwealth Public Service Co., a water company subsidiary

of the American States Public Service Co., Chicago.

C. W. WRIGHT has been appointed field materials engineer of the New Mexico state highway department. Previously Mr. Wright was office engineer for the city of Phœnix, Ariz.

DWIGHT REDMAN, engineer for the U. S. Indian Irrigation Service, has been placed in charge of the disbursing office at Wapato, Wash., where it has been moved from Yakima. L. M. Holt, formerly in charge at Yakima, has been transferred to Salt Lake City, Utah, as supervisor of projects in Washington, Oregon, Utah and Nevada.

WALTER B. E. ANTHONY, formerly employed as construction engineer with the Detroit water board, has joined the U. S. Engineer Corps and is now resident engineer in charge of the construction of the Brandon Road lock and dam, a unit of the deep waterway program near Joliet, Ill.

Costs in 33 Cities 21 Per Cent Below 1929 and 12 Per Cent Below 1930

COSTS on highways, buildings, sewers and water main construction furnished by contractors were given for 27 cities in last week's issue, p. 193. Similar costs in eight additional cities are presented on this page. Average decrease in cost in these cities exclusive of Tulsa and San Antonio, where the data are inconclusive, is 21 per cent from 1929 and 12 per cent from 1930.

Contractors in six other cities furnished current costs, but not comparative figures for other years. Two prominent New York contractors give $68 and $70 per ton as their respective costs for steel erected. These same two contractors give $55 and $42 per thousand for common brick in place, $8.50 and $11.50 per cu.yd., without forms, for concrete in reinforced-concrete buildings and 17c. and 23c. per sq.ft. for floor forms. One of these contractors gives 25c. for concrete floor arches. A third New York contractor gives $43.50 for common brick in place, $24.30 per cu.yd., including reinforcement, for cinder concrete floor arches without forms, and 14c. per sq.ft. for floor forms.

An Atlantic City contractor quotes 12-in. vitrified tile in place at $2.70 per linear foot in 1929 and $2.15 in 1930; concrete in place, 70c. in 1929. For cast-iron water mains in place he quotes, for 14-in., $3.35 in the summer of 1930 and $3.25 at present; 48-in. mains cost $5.94 in 1930.

A Memphis contractor gives present costs of erecting steel as $14 to $16 per ton; for bridge work 6½c. per pound; for common brick in place he gives $23.50; for concrete in reinforced-concrete buildings, per cubic yard without forms, $9.59; floor forms 6c. per sq.ft.

A Knoxville contractor gives $80 per ton for steel erected; $30 for common brick in place; $8 per cu.yd. for building concrete without forms; 22c. per sq.ft. for floor forms. Paving costs in Oklahoma City are 18c. per cu.yd. for earth excavation, $1.66 per sq.yd. for 7-in. concrete, $2.40 for 2-in. asphalt on 6-in. base. Building costs are given as $67 per ton for steel erected, $42 for common brick in place, $9 for building concrete without forms. Vitrified tile sewers in place cost 65c. per linear foot for 8-in.; 8-in. concrete pipe costs 62c.; 6-in. cast-iron water mains cost 92c.

A contractor of Decatur, Ill., gives $81 per ton for steel erected. His cost for common brick in place is $36 per thousand, against $44.50 in 1929.

TABLE I—CONTRACTORS UNIT CONSTRUCTION COSTS

Ames, Iowa

Highway	1929	1930	1931
Excav.	$0.19	$0.18	$0.17
Conc., 7-in., cu.yd.	9.75	10.20	9.00
Asphalt, 2-in., sq.yd.	0.73	0.65	0.54
Building Construction			
Steel, erection cost	13.00	12.00	11.00
Common brick	35.00	35.00	34.00
Cinder conc. fireproofing, beams and columns, without forms, cu.yd.	8.00	8.00	7.00
Cinder conc. floor arches, without forms, cu.yd.	8.00	8.00	7.00
Concrete in buildings	11.00	11.00	10.50
Floor forms, sq.ft.	0.13	0.13	0.14
Comparable Sizes and Depths, Lin.Ft.			
Sewers—Vit. Tile, in place	0.83	0.75	0.57
—conc. pipe, in place	0.84	0.76	0.61
Water mains—cast-iron, in place	2.25	1.75	1.70
—Steel, in place	1.75	1.50	1.35

San Antonio, Tex.

Highway	1929	1930	1931
Excav.	$0.54	$0.48	$0.22
Conc., cu.yd.	18.50	16.00	13.75
Asphalt, sq.yd.	0.90	0.62	0.32
Building			
Steel, erection cost	16.00	12.00	9.00
Common brick	38.00	34.00	26.00
Cinder conc., floor arches, without forms	7.00	6.00	4.00
Conc. in buildings	16.00	13.00	11.00
Floor forms	0.12	0.11	0.09
Comparable Sizes and Depths, in Place, Lin.Ft.			
Sewers—Vit. tile	0.90	0.72	0.51
—Concrete	1.10	0.94	0.41
Water mains—cast-iron	1.75	1.48	1.35
—Steel	1.60	1.50	1.30

Denver, Colo.

Highway	1929	1930	1931
Excav.	$0.676	$0.410	$0.265
Conc., 6½-in. center	2.02	1.79	2.01
Comparable Sizes and Depths, Lin.Ft.			
Sewers—8-in. vit tile, in place	0.62	0.59	none
Water mains—12-in. cast-iron, in surfaced streets	4.69	4.50	not available

Cincinnati, Ohio

Highway	Summer of 1929	Summer of 1930	Summer of 1931
Excav., cu.yd.	$0.50	$0.30	$0.20
Conc., 9-in., sq.yd.	2.45	2.00	1.55
Asphalt, 3-in., sq.yd.	1.60	1.50	1.40
Building Construction			
Steel, erected	77@78	79@88	74@88
Common brick, in place	40@43	34@40	37@44
Concrete in buildings	8.25@9.00	7.60@8.50	7.00@8.00
Floor forms	0.17@0.20	0.15@0.18	0.14@0.16
Comparable Sizes and Depths			
Sewers—Vit. tile, in place, lin.ft.	1.42	1.28	1.15
Water mains, c.i., in place, lin.ft.	1.16	1.05	0.97

San Francisco, Calif.

Building	1929	1930	1931
Steel, erected, office or apartment	$87.00	$84.00	$81.00
Common brick	35.00	35.00	30@35

Richmond, Va.

Highway	Summer of 1929	Summer of 1930	Summer of 1931
Earth excav., cu.yd.	$0.35@$0.45	$0.30@$0.40	$0.22@$0.33
Conc., cu.yd.	14.00	12.00	8.50
Asphalt, sq.yd.	0.90	0.65	0.49
Building Construction			
Steel, erected, ton	94.00	85.00	80.00
Common brick, in place, per M	33.00	30.00	27.00
Cinder conc., floor arches per cu.yd., without forms	11.00	9.50	8.75
Stone concrete in reinf.-conc. buildings, per cu. yd., without forms	11.00	9.00	8.50
Floor forms, sq.ft.	0.13	0.11	0.10

Peoria, Ill.

	1929	1930	1931
Building Construction			
Steel, erected	$83.00	$78.00	$70.00
Common brick	32.00	32.00	28.00
Concrete in buildings	8.10	8.10	6.75
Floor forms	0.13	0.12	0.12

St. Louis, Mo.

Highway	1929	1930	1931
Conc., 8-in. with 2-lb. mesh, sq.yd.	$2.85	$2.75	$2.50
Asphalt, 1½-in. top and 1½-binder, sq.yd.	1.75	1.70	1.60
Conc. base for asphalt, cu.yd.	8.50	8.00	7.00
Building Construction			
Steel, erection cost	27.00	25.00	22.00
Common brick	45.00	42.00	38.00
Concrete in buildings	10.00	9.00	8.00
Floor forms	0.24	0.20	0.18

TABLE II—CONSTRUCTION COST DECREASE FOR 1931 FROM 1929 AND 1930, PER CENT

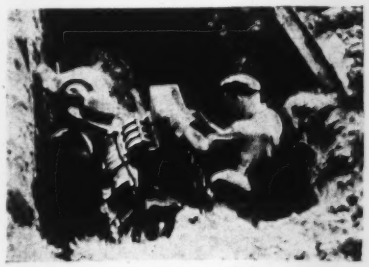
	Richmond, Va.		Cincinnati, Ohio		Peoria, Ill.		St. Louis Mo.		Ames, Iowa		San Antonio, Tex.		Denver, Colo.		San Francisco, Calif.	
Highway	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930
Earth excav.	31	21	60	33	..	..	..	..	11	6	59	54	61	35	..	..
Concrete paving	39	29	37	22	..	..	12	9	8	12	26	14	1	+12	..	..
Asphalt paving	46	25	13	7	..	..	9	6	26	17	64	48	..	..	..	..
Building																
Steel	15	6	8	9	16	10	19*	12*	15*	8*	46*	25*	..	..	7	9
Common brick	18	10	2	+9	12	12	16	10	3	3	32	23	..	..	7	7
Floor arches	20	8	..	..	..	..	..	..	13	13	43	33	..	..	..	..
Concrete	23	6	13	7	17	17	20	10	5	5	31	15	..	..	..	..
Forms	23	9	19	9	8	0	25	10	+8	+8	25	18	..	..	..	..
Sewers	..	..	19	10	..	..	..	..	29	22	56	45	5	..	..	..
Water mains	..	..	16	8	..	..	..	..	24	6	21	11	4	..	..	..
Average	27	14	21	13	13	12	17	9	15	10	40	28	..	..	..	..

*Erection cost only.

Construction Equipment and Materials

Boring Machine for Installing Small-Diameter Pipe

The need for a quick, economical method of installing drainage pipe that will not interfere with the travelled surface of roads or railroads has been met by a boring machine designed for the express purpose of installing corrugated iron drain pipe in 8-, 12- and 18-in. diameters by the Armco Culvert Mfrs. Association, Middletown, Ohio. The boring machine serves the double function of both excavating and removing material replaced by the pipe. It is mounted on a track, upon which it is moved forward as jacking progresses. The jacking itself is done by hand at the rear of the machine, an especially designed jack operating on a rack between the rails of the track. Power for excavating is provided by a gasoline motor and is transmitted to the borer by a shaft extending through the pipe. A spiral conveyor is built around this shaft, which, as it revolves, removes the

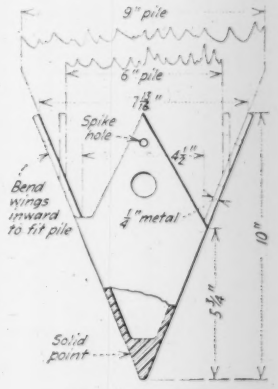


Machine installation of culvert

spoil through a smooth metal trough placed in the invert. When one section of pipe has been placed, the machine is returned to the starting point, another section of pipe and a corresponding length of lining and conveyor attached, and the process repeated.

Steel Shoe Protects Pile Points

Unsatisfactory experiences in railroad and harbor construction with pile shoes which became detached from the pile point before driving was completed have led G. C. Munoz, who was formerly engaged in railroad and harbor construction work and is now vice-president of the American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa., to design and patent a pressed steel shoe which is now being marketed by the company. This is made by welding two chevron-shaped pieces sheared from ¼-in. sheet steel to a welded steel point, shaped much like a plumb-bob with a blunt end, 1½ in. long and ⅞ in. in maximum diameter. The completed shoe is slipped on the pile point, which has been previously sharpened to a four-sided pyramidal point. It is fastened securely by driving 50-penny nails through the small nail holes provided at the wing points. Two sizes of the shoe are sufficient to care for all sizes of piles from

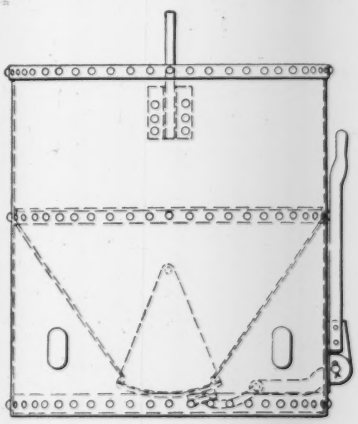


No. 1 Pile Shoe

5 to 14 in. in diameter at the point. No. 1 size, used for a maximum diameter of 9 in., weighs only 6¼ lb., while No. 2 size weighs 13¼ lb. This light weight, flexibility in application and the use of quantity production methods in manufacture make it economical to use the shoes freely whenever difficulty is encountered in driving piles.

Bucket for Handling Concrete

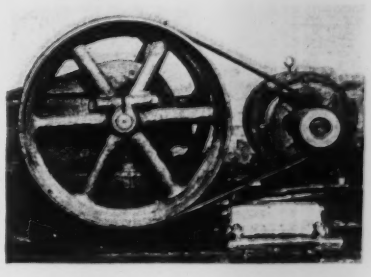
Simple design is a feature of the riveted steel bucket for conveying concrete which is made in 18-, 33- and 63-cu.ft. sizes by the Dayton Whirley Co., Dayton, Ohio. Larger buckets can be made on special order. Reference to the illustration shows the construction of the bucket, which is cylindrical in external form but has a tapered false bottom closed by a leak-proof radial gate that will not drip concrete or mortar. This gate is operated by a hand lever, the power of which multiplies twenty times when it is first broken open, but is reduced by toggle action to a 3 to 1 ratio after the gate is partly opened. This makes it possible to open or close the gate easily, regardless of the amount of concrete still in the bucket. The discharge opening is so shaped that it is easy to pour into narrow forms or to use the bucket as a floor hopper for loading buggies or wheelbarrows or for discharging into chutes.



Section of concrete bucket

Short Center Drive Uses Motor Weight to Keep Belt Tight

By the simple substitution of a new type of motor base for the customary motor rails, the Rockwood Mfg. Co., Indianapolis, Ind., has evolved a new type of short center drive which uses a part of the weight of the motor to maintain constant tension on the belt throughout the entire range of operation. A standard drive consists of this base, two paper pulleys and an endless leather belt, but it is often possible to adapt existing equipment in place of one or more of these elements. Drives can be obtained for all sizes of electric motors up to 500 hp., with special installations available for larger units. Marketing is through regular pulley distribution channels and also through the distribution



Motor weight maintains belt tension

10-hp., 1,800-r.p.m. motor driving air compressor.

organizations of leading manufacturers of leather belting. Applications to existing installations is facilitated by the fact that six sizes of base will fit all modern 60-cycle a.c. motors up to 50 hp. at 1,800 r.p.m.

The principle of operation of the new drive is extremely simple. Instead of using a fixed distance between pulleys with a rigid fastening of the motor, the latter is balanced on a pivot shaft at right angles to the belt and on the belt side of its center of gravity. With the belt in place, a part of the weight of the motor, acting through its center of gravity, tends to rotate the entire motor about its base in a direction opposed to the belt drive. The distance between the pivot and the center of gravity of the motor is so adjusted, in relation to the motor weight, that a predetermined

(Continued on page 234)

Current Construction Unit Prices

Concrete Sewers in Richmond

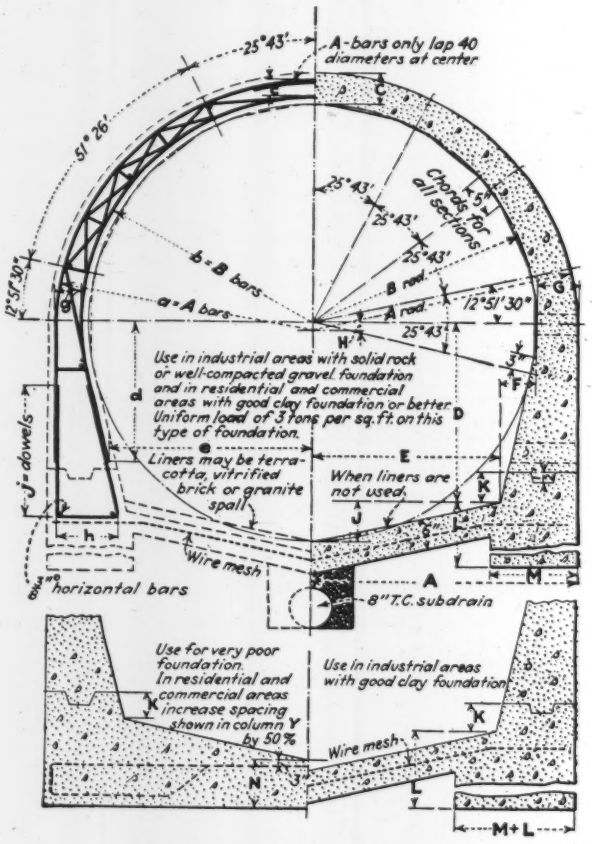
SHEPHERD ST. relief sewer in Richmond, Va., will relieve conditions in the territory west of the Boulevard and south of Shepherd St., where a 90-in. circular brick sewer and an 84-in. brick sewer empty into a 108-in. circular brick sewer which is the beginning of the Bacon Quarter and Shockoe Creek trunk sewer. Rainfalls of 1½ in. overcharge these sewers and flood basements and streets. To correct this condition a horseshoe-type concrete sewer entering into the Bacon Quarter branch sewer at Middlesex St. and paralleling the 108-in. line to the Boulevard has been designed and will be placed under contract at the first of the year. The only complications are two railroad crossings of 200 ft. and 100 ft. Alternate bids will probably be taken on an open-cut installation and on jacking 120-in. circular concrete pipe under the track.

The upper section of this project was awarded in April, 1931, to W. J. McLane, of Richmond, for $58,084. It consists of 670 ft. of 120-in. horseshoe-type concrete sewer; 364 ft. of 84-in., 315 ft. of 78-in. and 948 ft. of 72-in. precast reinforced-concrete pipe. The design of the horseshoe-type sewer adopted by the city was described in *Engineering News-Record*, Dec. 11, 1930, p. 937. The city furnishes to the contractor at site the following materials: 5,500 bbl. cement at $2.07; 14 manhole castings at $7.50; five basin castings at $5.20; 50,000 brick at $12.95; 84-in. precast reinforced-concrete pipe at $8.45; 78-in. precast reinforced-concrete pipe at $7.27; 52-in. precast reinforced concrete pipe at $6.04. This pipe is manufactured by the Concrete Pipe & Products Co., distance of delivery being 10 miles. The invert of the horseshoe sewer will be lined with salt glazed vitrified clay liners furnished by the Miller Mfg. Co. at 12½c. each and laid by the contractor at 30c. per square yard, seven plates to the square yard.

The first item is for 23,500 cu.yd. of earth excavation and divides as follows: horseshoe-type sewer—1,670 lin.ft. of trench, 12 ft. wide and 19 to 22 ft. deep; precast pipe—364 lin.ft. of trench for 84-in. pipe, 10.84 ft. wide and 19 to 23 ft. deep, and 315 ft. for 78-in. pipe, 10.34 ft. wide and 20 to 24 ft. deep; 948 ft. trench for 72-in. pipe, of which 400 ft. is 9.66 ft. wide and 15 to 20 ft. deep, and 548 ft. is 8.49 ft. wide and 15 ft. deep. The item covering 2,200 cu.yd. of reinforced concrete (exclusive of cement) at $8 is for horseshoe-type sewer and junction chamber. The 120-in. sewer runs 1.07 cu.yd. per linear foot in medium section and 1.62 cu.yd. in heavy section. The sewer requires 2,050 cu.yd. and the junction chamber the remaining 150 cu.yd. City furnishes 90 lin.ft. of Blaw-Knox inside steel forms and traveler for this sewer as well as the cement. Mix for invert and arch is 1:2:4, using seven bags of cement per cubic yard. In the medium section 83.5 lb. steel is required per linear foot and in the heavy section 132.15 lb. per foot.

Unite prices are given of the lowest three bidders: A, McLane, contract; B, Longley & Co., Bluefield, W. Va.; C, J. B. McCrary Engineering Corp., Atlanta, Ga. James Bolton is chief of the bureau of survey and design, and Louis Worker is office engineer.

	A	B	C
23,500 cu.yd. earth excav. main sewers	$0.95	$0.80	$0.80
500 cu.yd. rock excav. main sewers	2.00	2.00	3.00
Terra cotta pipe:			
50 lin.ft. 6 in.	.10	.20	.15
50 lin.ft. 8 in.	.10	.25	.15
25 lin.ft. 10 in.	.12	.30	.15
100 lin.ft. 12 in.	.15	.35	.20
100 lin.ft. 15 in.	.18	.40	.25
25 lin.ft. 18 in.	.30	.50	.30
25 lin.ft. 21 in.	.40	.60	.40
25 lin.ft. 24 in.	.40	.75	.50
100 cu.yd. brick masonry for manholes, basins, wall junction chambers	6.25	20.00	15.00
200 cu.yd. plain conc. cradle for all sewers and supporting walls	7.00	10.00	12.00
400 M ft. b.m. shoring in place	25.00	30.00	30.00
100 cu.yd. gravel, slag for refilling trench and foundation	2.00	4.00	3.50
25 cu.yd. plain conc. masonry in junction chambers	8.00	20.00	20.00
Precast reinf. conc. pipe, laid:			
20 lin.ft. 30-in.	.50	1.00	.75
20 lin.ft. 33 in.	.50	1.50	1.00
948 lin.ft. 72 in.	1.00	1.50	1.50
315 lin.ft. 78 in.	1.25	1.60	2.00
364 lin.ft. 84 in.	1.60	1.70	2.50
1,650 sq.yd. vitrified clay slab liners for inverts	.30	.40	.25
2,200 cu.yd. reinf. conc. in main sewer and junction chambers	8.00	7.00	9.95
41,755 lb. reinforcing steel	.046	.05	.045
154,880 lb. reinforcing steel	.041	.05	.0425
1,672 lin.ft. 12-in. T.C. underdrain without joints	.12	.30	.12
75 cu.yd. washed gravel for underdrain	3.00	4.00	3.50
250 cu.yd. cinder refill on top of trench	1.00	2.00	1.50
1,000 cu.yd. hardpan excav.	2.00	2.00	2.00
1 cast-iron pipe and vent ring in place	25.00	50.00	100.00
50 M ft. b.m. timber in foundation	27.00	30.00	35.00
Totals based on using vitrified slab liners for inverts	$68,084	$70,189	$75,180


A-bars only lap 40 diameters at center
25°43'
51°26'
12°51'30"
Chords for all sections
b=B bars
a=A bars
B rods
A rods
Use in industrial areas with solid rock or well-compacted gravel foundation and in residential and commercial areas with good clay foundation or better. Uniform load of 3 tons per sq.ft. on this type of foundation.
J=dowels
Liners may be terra-cotta, vitrified brick or granite spall
When liners are not used.
Wire mesh
horizontal bars
8" T.C. subdrain
Use for very poor foundation. In residential and commercial areas increase spacing shown in column Y by 50%
Use in industrial areas with good clay foundation
M+L

Richmond standard horseshoe sewer

Dredging Hudson River at Albany

BIDS were opened April 24, 1931, by the U. S. Engineer Office at New York City for removing 100,000 cu.yd. of soft material and 182,200 cu.yd. of ledge rock from the Hudson River in the vicinity of Albany. Material is to be removed above a plane 27 ft. below mean low water. Work is in four sections of the following dimensions: (1) 486 ft. long and 300 ft. bottom width; (2), 8,355 ft. long with bottom width 200 ft. for half the distance, decreasing to nothing at either end; (3), 4,775 ft. long with bottom width 200 ft. for 2,170 ft., when it decreases to 30 ft. bottom width and then widens to 230 ft. for a distance of 378 ft., decreasing again to nothing; (4), 324 ft. with bottom width 240 ft. Estimated quantities to be removed are given in Table 1.

Current Construction Unit Prices

TABLE I—QUANTITIES OF MATERIAL

Section	Ledge Rock (Cu.Yd.)	Av. Depth of Cut (Ft.)	Other Material (Cu.Yd.)	Area in Square Feet — Rock Only	Total
1	40	1.63	500	648	10,000
2	77,698	5.84	40,000	346,720	570,000
3	50,520	4.45	33,000	293,868	360,000
4	2	0.13	590	324	13,000
Total	128,260	5.40	74,000	641,560	953,000

TABLE II—UNIT PRICES

	100,000 Cu.Yd. Soft Material	182,000 Cu.Yd. Ledge Rock
Arundel Corp.	$0.48	$2.64
Standard Dredging Co.	.49	2.90
Trimount Dredging Co.	.50	2.89½
Dunbar & Sullivan Dr. Co.	.65	1.70
Great Lakes D. & D. Co.	.75	2.07
G. H. Breymann & Bros.	1.22½	1.22½
Average	.68	2.24
Office estimate	.80½	3.04

Ledge rock is known as Hudson River shale with an occasional seam of pyrites. Other material is sand, gravel, clay and broken rock, with some hardpan, cobble stones and boulders. The material is transported and deposited in a dumping basin excavated by the contractor in the river.

Complete unit prices are given in Table II. These prices may be compared with prices of a similar contract awarded in the third quarter of 1930. This contract was for 62,900 cu.yd. of soft material and 200,600 cu.yd. of ledge rock at Mulls, N. Y., 11 miles south of Albany. The average prices were 73c. for soft material and $2.48 for ledge rock, or, respectively, 7 and 10 per cent above the average of the prices for the present job, contract for which was awarded to the Dunbar & Sullivan Dredging Co. for 65c. for soft and $1.70 for rock. Col. G. M. Hoffman is district engineer.

New Lock 4 in Monongahela River, Pa.

NEW LOCK NO. 4 in the Monongahela River on the right bank near Charleroi, Pa., is 41.5 miles above the mouth. The Pittsburgh & Lake Erie Railroad passes directly alongside the site. Contract was let in February to the Dravo Contracting Co., Pittsburgh, for $1,196,917.

Work consists of materials and labor for constructing the fixed parts of the lock, upper and lower guide walls, and power house foundations. Items omitted from this contract are as follows: lock gates and anchorages, operating machinery for valves and gates, recess covers, piping except conduit under the lock chamber and 2-in. oil line to cross the lock chamber at the gate recesses, pipe supports in the pipe galleries, light poles and wiring, hydraulic turbines, power plant.

Cofferdams are of the box type. Payments are based on the linear feet of masonry inclosed, and the price per linear foot bid covers cost plus profit of all cofferdams reduced to unit prices per linear foot of permanent work.

Excavation includes all material above bedrock, except boulders exceeding 9 cu.ft. and any material requiring blasting. Fill behind the land wall is made with sand, gravel or rock. Riprap consists of one and two-man stone. Stones weighing more than 200 lb. are classed as derrick stones.

A cubic yard of concrete comprises five bags of cement, admixture or an additional half bag of cement, 2.4 cu.ft. gravel, sufficient sand to yield 15 per cent more mortar than required to fill the voids of the gravel.

Five bids were received and unit prices are given of the lowest two: A, Dravo Co., contract; B, Booth & Flynn Co., 1942 Forbes St., Pittsburgh, $1,227,372. Lowest bid on the cofferdam lock walls was $57.50 per linear foot; the other bids were $70, $100, $104, $120. For the guide walls the lowest bid was $16; the other bids were the same as for the lock walls. Lieut.-Col. Jarvis J. Bain is district engineer at Pittsburgh.

	A	B
1,048 ft. cofferdam lock walls	$70.00	$104.00
1,208 ft. cofferdam guide walls	16.00	104.00
81,623 cu.yd. common excav.	0.40	0.76
100 cu.yd. rock excav.	6.00	5.00
92,013 cu.yd. concrete	8.50	7.00
45,782 cu.yd. fill	0.30	0.33
190 cu.yd. riprap	6.00	6.00
456 cu.yd. derrick stone	7.00	6.00
25,711 ft. b.m. common timber	80.00	82.00
175,365 ft. wood piles	0.50	0.52
52,524 sq.ft. steel sheet piles	0.80	0.87
155,880 lb. structural steel	0.08	0.075
150,169 lb. reinf. rods	0.04	0.04
1,632,832 lb. class A steel castings	0.055	0.055
9,824 lb. class B steel castings	0.16	0.06
28,708 lb. iron castings	0.12	0.05
17,841 lb. bolts	0.10	0.09

Dredging at Saginaw, Mich.

CONTRACT was awarded in April, 1931, for dredging a channel 200 ft. wide in the Saginaw River and Saginaw Bay, Lake Huron, Mich., from the Sixth St. bridge at Saginaw downstream to the mouth of the river and then into the bay to deep water. Bids were received on depths of either 19½ ft. or 20½ ft. with overdepths, respectively, of 1.8 ft. and 2.5 ft. Contract was awarded on a bid of 24.42c. per cubic yard on the 20½-ft. depth, involving 1,572,000 cu.yd. plus 986,000 cu.yd. overdepth.

Usual range of water level is 1 ft., with a maximum of 3 ft. during short periods. River current is 1 m.p.h. In the working area the river channel is spanned by eight swing bridges with a minimum horizontal clearance of 67 ft. There are also numerous submarine telephone and power cables, gas and water mains, and overhead transmission lines. The channel was dredged to a width of 200 ft. and a depth of 16½ ft. in 1910-13, and maintenance dredging in the last two years restored this depth for a width of 150 ft. In the bay the channel was dredged to a width of 200 ft. and a depth of 18½ ft. in 1913 and the present channel is 18½ ft. deep, but not of full width.

Material is sand, silt, clay, a mixture of dry hard clay with sand, and some timber. Prices cover all classes except ledge rock. The material is placed on dumping grounds adjacent to the river or on a dumping ground in Saginaw Bay. If deposited adjacent to the river, it must be placed at hydraulic grades with variations in the height of the fill not more than 6 ft.

Seven contractors submitted prices, and all are listed in the accompanying table, which also lists the plant which each has available. Work is being done by the Duluth Superior Dredging Co. at a contract price of $722,344 under the supervision of the U. S. Engineer office, Detroit.

Company	Channel 19½ Ft. Deep 1,138,000 Cu.Yd. Place		Channel 20½ Ft. Deep 1,972,000 Cu.Yd. Place		Plant
Duluth Superior Dredging, Duluth			$0.2442	$722,344	Hydraulic dredge capacity sufficient for work.
Standard Dredging, 233 Bway., N. Y.	$0.29	$571,300	0.247	730,626	22-in. dredge "Mohawk" or equal.
Central Dredging, 307 No. Michigan Ave., Chicago.	0.33	650,100	0.27	798,660	20-in. hydraulic dredge, 4-yd. dipper dredge, three dump scows, steam tug.
Great Lakes Dredge & Dock, 104 So. Michigan Ave., Chicago	0.3325	655,025	0.2747	812,563	24-in. hydraulic dredge "New York," 10-yd. dipper dredge, tugs and scows.
Wm. J. Meagher, 5 Bay Block, Bay City, Mich.	0.33	650,100	0.26	828,240	20-in. hydraulic dredge "Shamrock," 2-yd. dipper dredge "Liberty," three dump scows, steam tug.
R. C. Huffman Constr. Co., 536 Terminal Tower, Cleveland	0.39	768,300	0.294	869,652	Dredge "Christobal," electric, or "Atlantic Beach," steam, 250,000 cu.yd. capacity each.
Zenith Dredge Co., Glencoe Bldg.	0.3975	783,075	0.2975	880,003	18-in. hydraulic dredge "Alive Vivian" and other plant sufficient for work.

Short Center Drive

(Continued from p. 231)

tension is constantly imposed on the belt regardless of stretch, whether the latter is due to centrifugal force or to atmospheric conditions. Two adjustable screws connecting to the two ends of the motor shaft make it possible to align the motor in a few minutes with a few turns of a wrench. These screws are also used to move the motor back to allow for permanent elongation in the belting.

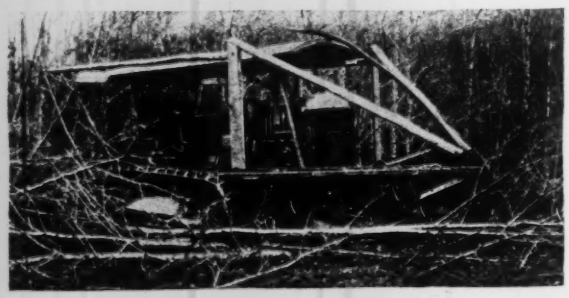
Drives can be mounted on floor, ceiling or wall, provided that the axis of the driven pulley is not lower than the axis of the motor pulley. Advantages claimed for the new drive include the following: an efficiency of more than 99 per cent; exceedingly long belt life; ability to handle overload, shock load and jerks; less belt creep; low bearing pressure on the motor bearings; low power consumption; favorable tension ratio between tight and loose side of the belt, and low maintenance cost.

Tractor Blade Attachment Cuts Brush and Small Timber

Originally developed and tested in Canada, a machine formerly known as the Hauser brushcutter, for clearing land of brush and small timber, is now being made and distributed by the LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa. Two sizes are available, for attachment to Caterpillar 60 and 30 tractors. Cutting widths are 12 and 9 ft., respectively. The size of material that can be cut and the speed of operation depends upon the character of the timber; it is stated that the large unit has successfully cut soft poplar trees as large as 18 in. in diameter. In brush and small timber it has cleared an average of 10 to 12 acres a day.

Elements of the brushcutter include a cutting blade, a heavy I-beam push frame which floats under the tractor, a special crossarm rear drawbar plate and a scissors hitch at the front of the tractor. The cutting edge is of the V type, similar in appearance to a snow plow, which tends to push the brush and trees to one side out of the path of the tractor. It is provided with three screw-regulated shoes, one at the front and one at each side, for regulating the cutting height. For transportation from one job to another two long runners are provided, controlled by a hand-operated hydraulic jack. The principal push point for the cutter is at the rear drawbar of the tractor, where a special crossarm drawbar plate is bolted to the tractor drawbar and is attached by chains to a large I-beam floating under the tractor and connecting the drawbar to the nose of the cutter. A second frame bolted to the side frame members of the tractor at the front holds a scissors hitch attached to the main push beam. This method of attachment leaves the tractor free to rise and fall without raising the cutting edge from the ground.

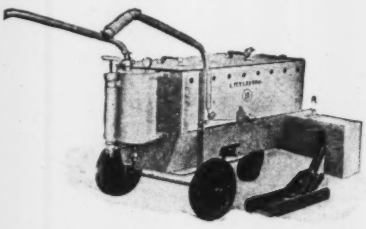
To protect the tractor mechanism and operator from falling timber, a superstructure made of poles is constructed on the job. Details of this can be seen in the illustration.



Clearing land with tractor-mounted brushcutter

Heated Asphalt Tank Fills Cracks and Marks Lanes

Satisfactory filling of joints in concrete pavement with asphalt is difficult because the filler has too much time to chill while being carried in the ordinary pouring pot from the heating kettle to the joint. By the time the asphalt is poured it is frequently so cool that it congeals too quickly and does not penetrate to the bottom of the joint. This difficulty is said to be eliminated with the new combination joint filler and line marker developed by Littleford Bros., Cincinnati, Ohio, which consists of a 20-gal. tank heated by two gasoline burners, one directly under the tank and another under the outlet valve. These burners are designed only to keep melted asphalt at the proper temperature, and should not be used to melt a batch of material. Both of them are protected by windshields and will operate in any kind of weather.



Joint filler and line marker combination

In connection with the joint-filling operation, an asphaltic traffic mark from 2 to 8 in. wide can be made on the pavement by the use of a marking attachment which is easily and quickly fitted to the machine. Another feature is an automatic hopper that spreads sand and chips over the joint as a protection from traffic.

New Publications

Pumps—Byron Jackson Co., Berkeley, Calif., in bulletin 316 describes deep well turbine pumps of various sizes and types, and gives data permitting proper selection for various installations.

Material Handling—New literature issued by the George Haiss Mfg. Co., Inc., 391 Canal Place, New York City, includes bulletins describing the models 50 and 80 loaders, the Hi-tonnage coal loader and clamshell buckets.

Road Maintenance Equipment—Possibilities of the Super Workman, a combination road reclaimer, maintainer and rake produced in two sizes, are discussed in a folder now being distributed by the York Modern Corp., Unadilla, N. Y.

Alloy Steel—The story of the production, characteristics and uses of Agathon alloy steels is given in a 132-p. illustrated book of which the third edition has been published by the Republic Steel Corp., Youngstown, Ohio.

Valves and Piping—Bulletin 44 of the Semet-Solvay Engineering Corp., 40 Rector St., New York City, is a 48-p. illustrated publication dealing with the layout of pipe systems, fittings, valves, and other details of piping installations.

Electrical Conduit—Tools and special equipment used in the installation and maintenance of electrical conduit, cable and distribution wiring, whether underground, overhead or inside of buildings, are described in a 25-p. illustrated catalog of B. S. Barnard & Co., 130 Lafayette St., New York City.

Grading Equipment—Recent publications of the Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill., include bulletin W-31-H, on crawler dump wagons of 5, 7, and 8 to 10 cu.yd. capacity; bulletin 1230 on mammoth senior graders with both leaning and straight wheel equipment, and folders describing Western crawler dump wagons and Austin Autocrat rollers.

Lead—"Useful Information About Lead" is the title of a 104-p. illustrated book, bound in cloth, which has been issued by the Lead Industries Association, 420 Lexington Ave., New York City, at 50c. per copy. The story of lead, its production and principal uses is the theme of this volume. Short chapters are devoted to the major industries consuming lead as well as to the history, mining, smelting and refining of the metal. Tables are presented giving the mechanical, thermal, electrical, optical and other properties of lead as well as the characteristics and uses of the various lead compounds.

Pipe—Armco spiral welded pipe forms the subject of a 40-p. illustrated bulletin issued by the American Rolling Mill Co., Middletown, Ohio. This contains specific information helpful to the user of specially designed pipe in diameters of from 6 to 24 in. and with a variety of wall thicknesses. It describes the spiral welding process, discusses various types of coatings, couplings, joints, fittings and flanges; and gives a number of tables on pipe specifications, car loadings and hydraulic data. The company has also issued a 4-p. engineering bulletin "Designing Pipe Lines for Pressure," which, as the name implies, explains the use of spiral welded pipe to meet various pressure requirements without superfluous wall thickness.

Transportation of Concrete—A detailed account of tests carried on at the Fritz Engineering Laboratory of Lehigh University with respect to the Clinton process of conditioning ready-mixed concrete during haulage is given in a 32-p. illustrated booklet published by the Clinton Motors Corp., Reading, Pa. The purpose of the test was to determine, first, the relation between the strength of concrete and the length of time it was retained in the drum of the conveyor; and second, whether a drum without blades would maintain homogeneity of the concrete during transportation.

Welding—Fabrication of pressure vessels, tubular equipment, penstock piping, bends and forgings is described in a new bulletin, "Special Process Equipment," issued by the Babcock & Wilcox Co., 85 Liberty St., New York City. A section of the book discusses a new welding technique which is said to produce welds equal to or better than the work metal in tensile strength, shock resistance, ductility and ability to withstand repeated stresses. Another section discusses the production of alloy castings.

Business Side of Construction

Month's Contracts Exceed a Year Ago For the First Time

In July, for the first time this year, contract volume exceeded that of the corresponding month a year ago. The month's total was $270,000,000 as compared with $264,000,000 in July, 1930. The rate per week was $54,000,000, which checks exactly with the weekly rate for the whole of 1931 to date, and compares with $68,000,000 in the seven months of 1930.

Included in the month's contracts are three unusually large projects: $25,000,000 in separate contracts to be let by the Phoenix Utility & Construction Co. for a hydro-electric plant and concrete dam on White River near Cotter, Ark.; $12,000,000 office and store for the Marshall Field Estate in Chicago, of which the first unit, 100x189 ft. in plan, is to start at the end of the year; $21,861,654 for the Golden Gate Bridge at San Francisco. The July, 1930, contract total included only one outstanding project: $12,257,075 for the Indianapolis Power & Light Co. power plant and 45 miles of high-tension steel towers.

Regional Distribution

Geographically the gain was made in the Middle Atlantic States, in the region between the Mississippi River and the Rocky Mountains and in the Far West. Significantly, this half of the country, except the Far West, recorded strong gains in private contract letting. Private contracts for the country totaled $121,000,000 against $124,000,000 in July, 1930; public contracts, $148,000,000 and $139,000,000.

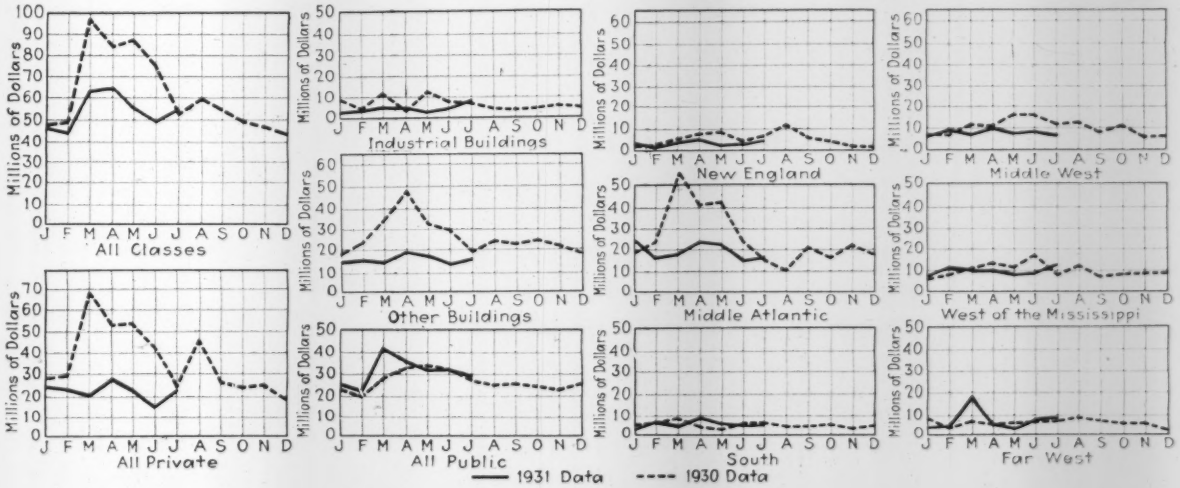
For the seven months, public construction is 8 per cent ahead of last year, private 42 per cent below. The leading classes and their per cent gains over last year are: water-works, 33; bridges, 37; excavation and drainage, 8; roads, 2; and federal government work, 176 per cent. The classes showing losses are sewers, 16 per cent; industrial and commercial buildings, 45; public buildings, 20; and unclassified structures, 32 per cent. Contracts for the seven months of 1931, as before stated, averaged $54,000,000 per week compared with $68,000,000 in the same period of 1930. But the average weekly rate in the *last five months of 1930* was only $50,000,000.

An average weekly rate, therefore, of $72,000,000 for the next five months would bring the money value of engineering construction contracts awarded this year to the same figure as those of last year. At the continued rate of $54,000,000 per week, the year's total will be only 12 per cent below the 1930 total and actual structural volume, due to materially lower costs, will be equal to that of 1930.

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN JULY, 1931

Thousands of Dollars (000 omitted)

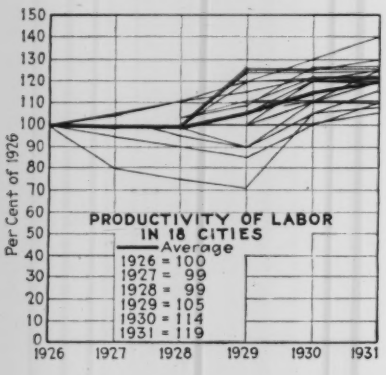
	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States July, 1931	United States Seven Months 1931	United States Seven Months 1930	Canada July, 1931
Waterworks	$891	$1,168	$71	$906	$322	$2,178	$5,536	$40,102	$29,976	$1,593
Sewers	469	2,701	104	866	1,033	524	5,697	41,470	48,567	29
Bridges, public	548	363	1,937	1,142	2,388	22,142	28,520	79,680	66,149	.....
Excavations	111	195	363	149	362	.....	1,180	13,738	12,747	385
Streets and roads	3,259	13,478	8,135	10,442	15,247	5,950	56,511	393,462	386,817	517
Federal government	1,209	1,457	10,599	2,823	4,339	2,133	22,560	170,819	66,806	.....
Unclassified, public	595	1,594	461	503	152	824	4,129	53,744	74,432	125
Buildings, public	7,234	7,798	483	5,430	1,647	2,059	24,651	148,914	186,310	450
Total public	14,316	28,754	22,153	22,261	25,490	35,810	148,784	941,929	871,804	3,099
Buildings, industrial	1,069	3,520	106	2,986	28,225	2,757	38,663	132,955	238,881	505
Buildings, commercial	4,665	32,352	1,000	14,400	1,050	1,775	55,242	368,961	674,570	1,901
Bridges, private	.....	.....	1,325	925	.....	.....	2,250	8,828	9,001	500
Unclassified, private	150	18,098	693	1,255	4,550	425	25,171	211,584	320,124	.....
Total private	5,884	53,970	3,124	19,566	33,825	4,957	121,326	722,328	1,242,576	2,906
July total, 5 weeks	**20,200**	**82,724**	**25,277**	**41,827**	**59,315**	**40,767**	**270,110**	.....	.....	**6,005**
June, 1931, 4 weeks	14,851	64,263	20,555	33,293	33,852	29,512	196,326	.....	.....	5,669
July, 1930, 5 weeks	31,339	73,375	27,679	53,393	44,358	33,413	263,557	.....	.....	14,123
Seven months, 1931	114,707	609,383	171,087	259,373	286,708	222,999	.....	1,664,257	.....	64,676
Seven months, 1930	152,363	925,739	171,397	342,562	321,451	200,868	.....	.....	2,114,380	101,234

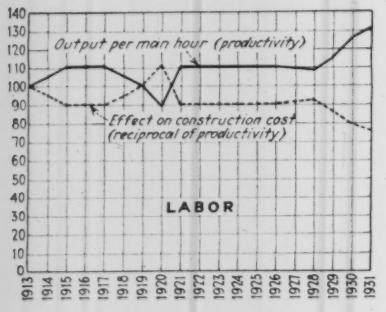


Contracts awarded, showing trend by classes and sections

Man-Hour Output 19 Per Cent Above 1921-27 and 4 Per Cent Above 1930

Contractors from Boston to Atlanta and from New York to San Francisco estimate that labor productivity this year averages 19 per cent more than in 1926-28 and 4 per cent more than in 1930. The data are given in the accompanying table for the years 1927 to 1931 on the basis of 1926 equals 100. The figures are remarkably even, as Chart 1 shows. The greatest increase in output is in Chattanooga and amounts to 35 per cent more than in 1926 and 1927; the smallest in Trenton, 5.





Estimates has been obtained for labor productivity in New York City from 1913 to date. Chart 2 shows these figures from 1913 to 1926 and the general average for the 18 cities from 1927 to 1931. The chart shows these figures (productivity of labor) and the reciprocal of these figures (cost reduction effected by increased output.

This productivity curve has also been plotted on our cost index chart and will be continued in other issues.

PRODUCTIVITY OF LABOR

	1926 = 100				
	1927	1928	1929	1930	1931
Anderson, Ind	100	100	110	120	120
Auburndale, Mass.	80	75	71	105	108
Boston	100	100	120	120	120
Canton, Ohio	100	100	125	125	130
Chattanooga	100	110	120	130	135
Chicago	100	100	105	120	125
Cincinnati	105	110	115	120	120
Duluth	100	100	105	110	120
Knoxville	100	100	100	120	120
Lincoln, Neb.	100	100	100	110	125
Milwaukee	100	100	110	110	110
Montgomery, Ala.	95	90	85	100	110
New York	100	104	108	125	125
St. Louis	100	95	90	105	115
San Francisco	100	100	125	125	125
Sioux City	100	100	105	105	115
Syracuse	100	100	90	110	110
Trenton	100	100	100	100	105
Average	99	99	105	114	119

Wages Down As Employment Shows Gain

Wages actually being paid five trades in 32 cities average 95c. per hour against an average official or union rate of $1.15. This is a break in the official rate amounting to 17 per cent. The actual and official wage rates are given in the accompanying table.

Two facts indicate an increase in construction employment over a year ago. One is an increase in construction volume as indicated by the *ENR* volume index, the figure for July being 22 per cent above that of July, 1930. The other is a report of the Department of Labor on July 18 that 3,423 contracting companies in 20 cities had 49,546 men on a payroll amounting to $1,485,426. This is a gain of 2.7 per cent in number of men and 2.1 per cent in payroll as compared with one year ago.

Los Angeles—Thirteen thousand men are working alternate weeks on municipal projects financed by emergency employment fund, and present relief measures probably will continue in force until November. Effective Aug. 14, all contracts on public projects throughout California must specify wages to be paid each grade of labor. Rates are predetermined by the awarding official.

Baltimore—Five contractors were indicted July 23 for violation of charter provision fixing minimum wages on all municipal construction work.

Pittsburgh—Non-union riveters on county bridge job walked out July 2, demanding union rate of $1.27 per hour instead of 40c. to $1 being paid. County commissioners passed resolution requiring contractors to accept local union scale as the prevailing rate.

Columbus, Ohio—Common labor rate on state highway work fixed for remainder of 1931 by agreement of contractors and director of highways—50c. in Cuyahoga and Montgomery counties; 45c. in Lucas and Hamilton counties; 40c. in Franklin County, and 35c. minimum for the rest of the state.

Westchester County, N. Y.—A strike of 900 laborers called July 9 on county highway projects worth $3,000,000 was settled Aug. 3 by the contractors agreeing to meet the demands of the American Federation of Labor.

Olympia—State highway director instructed by governor to award road contracts only to those specifying employment of citizens of the state. Violation of this ruling will mean forfeiture of contract.

Kearny—Work stopped July 8 on bridges over Passaic and Hackensack Rivers, state highway route 25 between

PREVAILING AND UNION WAGE RATES IN 32 CITIES

	Carpenters	Bricklayers	Plasterers	Ironworkers	Common	Average 5 Trades
Amarillo, Tex.	$1.00	$1.50	$1.50	$1.00	$0.35	$1.07
Union	1.12½	1.50	1.50	....	.50	1.16
Anderson, Ind.	0.85	1.00	0.95	1.10	0.40	0.86
Athens, Pa.	0.60@1.00	0.80@1.00	1.00	....	0.30	1.18
Union	1.18½	1.62½	1.62½	....	.50	1.24
Atlanta	0.60@0.80	1.12½	0.75@1.00	1@1.25	0.20@0.30	0.78
Union	.60@ .70	1.25@1.40	1.00@1.25	1.25	.25@ .30	.89
Canton	1.15	1.50	1.25@1.50	1.00	0.50	1.11
Union	1.25	1.50	1.75	1.25	.50@ .65	1.34
Chattanooga	0.65	0.80	1.00	0.90	0.15	0.70
Union	.75	1.50	1.50	1.00	.30	1.01
Cincinnati	1.00@1.40	1.25@1.62½	1.25@1.62½	1@1.40	0.40@0.60	1.21
Union	....	....	....	....	....	1.21
Cleveland	0.75@1.37½	1.25@1.50	1@1.12½	1@1.25	0.40@0.50	1.02
Union	1.37½	1.62½	1.62½	1.50	.87½	1.40
Columbus	0.75@0.90	1.25@1.56½	0.90@1.10	1.00	0.40@0.50	0.93
Union	1.12½	1.56½	1.62½	1.25	0.50	1.21
Duluth	0.90	1.30	1.30	1@1.25	0.50@0.65	1.04
Union	....	....	....	....	....	1.04
Durham, N. C.	0.40@0.60	0.50@0.75	0.50@0.75	....	0.20@0.25	0.49
Union	.75	1.00	1.25	....	....	.81
Harrisburg	0.65@0.90	1.25	0.70@1	1@1.10	0.32@0.55	0.83
Union	1.00	1.50	1.25	1.25	0.55	1.11
Indianapolis	0.98	1.30	1.26	1.16	0.40	0.82
Union	1.26	1.62½	1.58	1.45	.50	1.28
Kansas City	1.32½	1.62½	1.62½	1.37½	.82½	1.36
Union	1.37½	1.62½	1.62½	1.37½	.82½	1.36
Knoxville	0.40@0.50	0.50@0.60	0.50	none	0.20@0.25	0.42
Union	0.87½	1.25	1.25	0.85	.30	.91
Los Angeles	0.87½	1.12½	1.12½	0.90@1	0.50	0.92
Union	1.00	1.37½	....	1.12½	.50	1.00
Memphis	0.85	1.62½	1.50	....	0.25	1.06
Union	1.00	1.62½	1.56	1.25	.30	1.15
Milwaukee	1.10	1.40	1.25	1.20	0.40@0.45	0.78
Union	1.10	1.40	1.50	1.20	.75	1.19
Minneapolis	0.75@0.85	1.00@1.10	1.10@1.25	....	0.40@0.45	0.85
Union	.90@1.00	1.30	1.30	1@1.25	.50@ .65	1.00
Montgomery	0.50	0.75	0.75	0.60	0.15@0.20	0.56
Union	....	....	....	....	....	.56
Oklahoma City	0.60	0.65	0.65	0.75	0.30	0.59
Union	.87½	.90	.80	.90	.50	.80
Pueblo	0.75	1.00	0.75	1.25@1.50	0.25@0.50	0.86
Richmond	0.90	1.50	1.25	1.50	0.40	1.11
Union	.80	1.50	1.25@1.50	....	.40	1.09
San Antonio	1.00	1.50	1.50	1.00	0.31¼	1.06
Union	1.12½	1.62½	1.62½	1.25	.40	1.20
Sioux City	1.12½	1.50	1.37½	....	0.35@0.50	1.11
Union	....	....	....	....	....	1.11
St. Louis	1.50	1.75	1.75	1.75	.875	1.53
Union	....	....	....	....	....	1.53
Syracuse	0.60@1.00	0.60@1.00	0.60	1.37½	0.30@0.50	0.76
Union	1.32	1.65	1.65	1.50	.825	1.40
Trenton	1.25	1.65	1.65	1.75	0.40@0.50	1.35
Union	1.75	1.75	....	....	.40	1.50
Youngstown	1.25	1.50	1.50	1.25	0.75	1.25
Union	1.37½	1.62½	1.62½	1.50	.97½	1.42
Oswego, N. Y.	1.00	1.50	1.50	1.25	0.40	1.13
Union	1.00	1.50	1.50	1.25	0.40	1.13
Peoria, Ill.	1.20	1.50	1.50	1.25	0.35@0.75	1.28
Union	1.20	1.50	1.50	1.25	....	1.36
Charleston, W. Va.	0.75@1	1.50	1.00	0.75@1.25	0.30@0.35	0.86
Union	1.12½	1.50	1.25	1.25	0.30@0.40	0.97

Holland Tunnel and New Jersey shore resorts. Local unions demand closed shop with the union rate of $16 per day adopted as the prevailing rate. On July 15 200 men resumed work at the open shop rate of $14.

Wage Rates—The average hourly rate for skilled building-trades mechanics is $1.19 per hour, compared with $1.23 in July and $1.39 in August, 1930. The skilled wage in manufacturing is 63.9c. per hour. The national average for common labor is 44.84c. per hour, compared with 47.21c. in July and 56.15c. in August, 1930. The unskilled rate in manufacturing is 46.4c. per hour.

Steel One of Several Important Materials to Lower Price

Building materials as a group have decreased only about 4 per cent in price in the last year, according to *ENR* monthly quotations. The accompanying table gives average current, month-ago, and year-ago prices of a dozen leading materials, in 20 cities. Cement, though 17 per cent below the price of a year ago, rose 5c. during the last month. Very slight increases are noted also in crushed stone, common brick, lumber and sewer pipe. Small decreases are shown in hollow tile and hydrated lime. Prices of other materials are the same as a month ago. Three materials, namely, crushed stone, hollow tile and lump lime, are actually a little higher than in August, 1930.

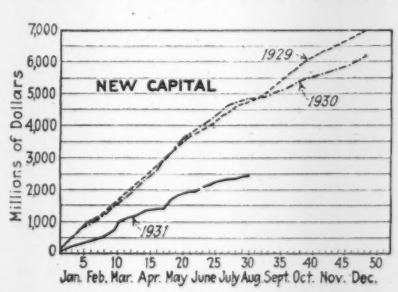
Capital and Contracts

New capital issues of the last week in July totaled 44 millions—25 private and 19 public. Since July 1 the average has been 43 millions, weekly, compared with 63 in June and 142 in July, 1930. The principal issues of the week include West Penn Power, 4s, $10,000,000; Pennsylvania Electric, 3½s, $9,000,000; Luzerne County, Pa., 3¾s, $2,000,000; Passaic, N. J., 4¼s, $1,470,000.

This week's contracts, with comparisons, are given below;

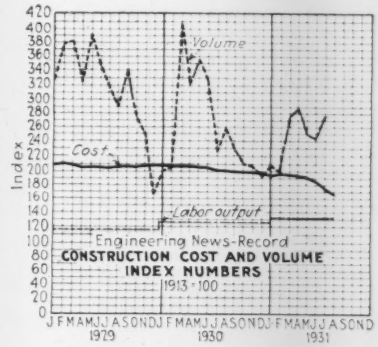
(In Thousands of Dollars)

	Aug. 6, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,660	$7,846	$7,834
Other	8,995	12,362	23,651
Streets and Roads	6,589	9,521	14,414
Other Construction	12,722	18,093	19,173
Total	$29,966	$47,823	$65,072
Total, all classes, Jan. 1 to Aug. 6:			
1931	$1,694,223		
1930	2,222,967		



Construction Cost and Volume Index Numbers

Cost index is lowest since June, 1922, at which time the number touched 166.62. The current index of 168.38 is 3.4 per cent under that of July and 16 per cent below that of August, 1930. July volume was 13.9 per cent greater than that of June and 22.5 per cent larger than that of July, 1930.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CONSTRUCTION COST AND VOLUME INDEX NUMBERS
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1929
1930
1931

E. N.-R. Cost		E. N.-R. Volume	
August, 1931	**168.38**	**July, 1931**	**227**
July, 1931	174.37	June, 1931	243
August, 1930	200.95	July, 1930	226
1930 (average)	202.85	1930 (average)	260
1929 (average)	207.02	1929 (average)	317
1913 (average)	100.00		
1930		1930	
January	208.96	January	199
February	206.46	February	204
March	206.80	March	408
April	207.12	April	320
May	205.86	May	354
June	203.36	June	324
July	200.95	July	226
August	200.95	August	259
September	199.58	September	232
October	198.72	October	211
November	198.54	November	207
December	196.86	December	192
1931		1931	
January	194.48	January	208
February	196.61	February	198
March	194.51	March	278
April	191.63	April	289
May	189.33	May	251
June	187.23	June	243
July	174.37	July	277
August	168.38		

Car loadings are below year-ago figures by the following per cents: Brick and clay products, 18; iron and steel, 15; cement, concrete aggregates and lumber, 12; lime and plaster, 8; explosives, 6, and prepared roofing, 2.

Operating rate of the steel industry advanced two points to 32 per cent in the last week of July. Orders for fabricated structural steel last month averaged 35,000 tons per week against 21,000 tons in June and 71,000 in July, 1930. The price at Pittsburgh dropped 5c. to $1.60. Of the 60 members comprising the Steel Founders Society of America, 55 are operating at a rate below 50 per cent of capacity, but 31 have reported a fair outlook for fall business.

Cement dealers in Baltimore, Birmingham, Denver, Kansas City and San Francisco have increased their delivered prices 10c. per barrel. In New York and northern New Jersey, the last territory to feel the effects of recent severe price cutting, prices are dropping. Of more importance than price, even, is the fact that certain manufacturers are making truck deliveries direct to purchasers. The city of Denver will use only Colorado cement on public works unless outside mills quote prices 5 per cent below local rates.

Unfilled lumber orders total 635,000,000 ft., or 70 per cent below orders of a year ago. Mill stocks total 4,200,000,000 ft., or 7 per cent less than a year ago. Southern pine mills are operating at 20 per cent capacity, while the West Coast mills are at 35 per cent and expect to continue that rate until October. Mill prices in the West have dropped from $20 per 1,000 ft. for 1-in. stock in May, 1929, to $12 quoted at present, a 40 per cent decline. Retail price of fir in Seattle is $17.50, a drop of 17 per cent for 1-in., delivered. Imports in three months have amounted to 177,000,000 ft. for lumber of all grades.

Hollow-tile prices dropped in Atlanta, Baltimore and Pittsburgh. Common brick dropped in Pittsburgh and Los Angeles and advanced in New Orleans and Atlanta.

Price of asphalt is up $1 per ton in Atlanta, $2 in Los Angeles, and $2.50 in Birmingham. Decreases are reported in Cleveland and Montreal.

AVERAGE DEALERS' DELIVERED PRICES

20 CITIES	August, 1931	July, 1931	August, 1930	1931 Ch'ge Per Cent
Cement, net, per bbl.	$2.00	$1.95	$2.42	−17
Gravel, per ton	2.22	2.22	2.33	−5
Crushed stone, per ton	2.47	2.46	2.41	+2
Sand, per ton	1.79	1.79	1.90	−6
Hollow tile, 4x12x12, per block	.081	.083	.079	+2
Common brick, per M	13.28	13.24	14.01	−5
Lime, hyd. fin., per ton	21.00	21.10	21.91	−4
Lime, com. lump, per bbl. sm.	2.28	2.28	2.12	+7
Timbers, 3x12s, pine, per M ft.	60.50	60.37	63.06	−4
Timbers, 3x12s, fir, per M ft.	44.88	44.68	48.61	−8
Sewer pipe, 12 in., per lin. ft.	.494	.493	.511	−4
Mill price, Pittsburgh, base:				
Structura. steel, per 100 lb.	1.60	1.65	1.65	−3
Rein. bars, per 100 lb.	1.60	1.60	1.60	0
Mill price, Birmingham:				
Cast-iron pipe, B, 12 in. per ton	35.00	35.00	37.00	−5
Average decrease				−4

Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type**; declines by *italics*

Building Materials

PORTLAND CEMENT—Prices per barrel, for cement in cloth, *without including charge for four bags at 10c. each*. Cash discount not deducted. Prices are delivered by truck to contractors at site of job:

	Aug. 6, 1931	One Mo. Ago	One Yr. Ago
Atlanta	$2.15	$2.15	$2.49
Baltimore	**1.82**	1.75	2.60
Birmingham	**2.40**	2.30	2.60
Boston	2.20	2.20	2.40
Chicago	1.95	1.95	2.20
Cincinnati	1.60	1.60	2.94
Cleveland	*1.25*	1.40	2.80
Dallas	1.88	1.88	2.15
Denver	**2.80**	2.15	2.61
Detroit	2.08	2.08	2.60
Jersey City	*1.89*	2.04	2.60
Kansas City	**2.10**	1.82	2.50
Los Angeles	2.10	2.10	1.92
Minneapolis	2.15	2.15	2.50
Montreal	2.18	2.18	2.20
New Orleans	1.95	1.95	2.65
New York	1.85	1.74	2.10
Philadelphia	2.00	2.00	2.10
Pittsburgh	1.81	1.81	.....
St. Louis	1.85	1.85	2.45
San Francisco	**2.44**	2.34	2.64
Seattle	1.70	1.70	.....

Current mill-prices per barrel, in carloads, without including charge for four cloth bags, f.o.b.:

Alpena, Mich	$1.30	Limedale, Ind	$1.20
Buffington, Ind	1.10	Mason City, Ia	1.10
Hannibal, Mo	1.10	Norfolk, Va	1.71
Houston, Tex	1.94	Northampton, Pa	1.21
Hudson, N. Y	1.31	North Birmingham, Ala	1.41
Ironton, Ohio	1.06	Richard City, Tenn	1.41
Iola, Kan	1.10	Universal, Pa	1.21
La Salle, Ill	1.10	Wyandotte, Mich	1.30

SAND AND GRAVEL—Per ton, delivered by dealers. Gravel, sizes ¾-in. or 1½-in. Weight of either, 3,000 lb. per cu. yd., unless otherwise specified:

	Gravel	Sand
Atlanta	*$3.00*	*$2.00*
Baltimore	2.55	2.08
Birmingham, per cu.yd., 2,600 lb	*Slag used*	2.25
Boston	1.60@1.75	.90@1.15
Chicago, per cu.yd	2.00	2.00
Cincinnati	1.50	1.25
Cleveland, per cu.yd., 3,000 lb	2.60	2.50
Dallas, per cu.yd., 2,750 lb	3.00	2.50
Denver, per cu.yd., 2,700 lb	1.95	1.35
Detroit	1.85	1.65
Kansas City	2.00	2.00
Los Angeles	2.20	1.50@1.70
Minneapolis, per cu.yd., 2,800 lb	1.70@2.40	1.00
Montreal	1.50	1.25
New Orleans, per cu.yd., 2,700 lb	2.95	1.80
New York, per cu.yd.; gravel, 2,800@3,000 lb.; sand, 2,700 lb	3.15	2.15
Philadelphia	2.35@3.20	1.55@2.40
Pittsburgh	1.55	1.75
St. Louis	**1.75**	**1.35**
San Francisco	1.75	1.75
Seattle, per cu.yd., 3,200 lb	1.85	1.85

CRUSHED STONE—Per ton, sizes, ¾-in. or 1½-in., limestone, delivered by dealers. Weight, 3,000 lb. per cu.yd., unless otherwise specified:

Atlanta	*$3.00*
Baltimore	2.80
Birmingham	*Slag used*
Boston	1.90@2.00
Chicago, per cu.yd., 2,500 lb	2.00
Cincinnati	2.25
Cleveland	2.60
Dallas, per cu.yd., 2,500 lb	3.25
Denver, granite, per cu.yd., 2,700 lb	2.50
Detroit	2.00
Kansas City	2.00
Los Angeles	2.20
Minneapolis, per cu.yd., 2,600 lb	2.40
Montreal	2.00
New York, per cu.yd	3.15
Philadelphia	2.30@3.15
Pittsburgh	3.25
St. Louis	**1.75**
San Francisco, trap rock	1.65
Seattle, per cu.yd., 2,700 lb	3.00

CRUSHED SLAG—Prices for carloads, per net ton, at plant:

	1½-In.	¾-In.	Roofing	Sand
Birmingham, Ala	$0.90	$1.15	$2.05	$0.55
Buffalo District	1.25	1.35	2.25	1.25
Cleveland, Ohio	1.10	1.10	2.25	.70
Western Pennsylvania	1.25	1.25	2.00	1.25
Toledo, Ohio	1.10	1.10	1.10	1.00
Youngstown District	1.25	1.35	2.00	1.25

CONCRETE BLOCKS—Standard, 8x8x16-in., hollow, delivered to job, each:

Birmingham	$0.084	Kansas City	$0.18
Boston	.16@.20	Minneapolis	.11
Brooklyn and Queens	.12	New Orleans	.20
Cleveland	.16@.17	Philadelphia	.18@.25
Denver	.22	Pittsburgh	**.20**@.22
Detroit	.12	St. Louis	.14

HOLLOW TILE—Building tile per block, delivered by dealers to contractors in lots of 2,000 pieces or over:

	4x12x12	6x12x12	8x12x12	10x12x12	12x12x12
Atlanta	*$0.09*	*$0.12*	*$0.14*	*$0.18*	*$0.24*
Baltimore	*.095*	.175	.20	.....	.26
Birmingham	.089	.122	.167	.219	.25
Boston	.082	.118	.152	.21	.35
Chicago	.068	.0935	.1275	.1647	.183
Cincinnati	.06815	.09485	.129	.165	.184
Cleveland	.048	.066	.09	.117	.13
Dallas	.0885	.1255	.1485	.251	.306
Denver	.0975	.135	.175	.2125	.25
Detroit	.08	.11	.145	.19	.215
Kansas City	.088	.11	.145	.19	.215
Los Angeles	.09425	.134	.188	.2325	.3115
Minneapolis	.0611	.081	.10605	.1302	.1737
New Orleans	**.068**	**.093**	**.13**	**.176**	**.212**
New York	.075	.125	.14	.....	.....
Perth Amboy, N. J.(f.o.b.)	.....	.....	.....	.2388	.2956
Philadelphia	.105	.14	.215	.28	.34
Pittsburgh	*.041*	*.058*	*.0845*	*.111*	*.12275*
St. Louis	.075	.10	.14	.175	.21
San Francisco	.108	.156	.255	.....	.....
Seattle	.085	.115	.18	.....	.....

BRICK—Prices delivered by dealers per thousand, are as follows:

	Common	Face	Paving F.O.B. 3x8½x4-in	Paving F.O.B. 3½x8½x4-In.
Atlanta	**$13.00**	$21.50	$32.00	$37.00
Baltimore	12.50	25.00@35.00	40.00	46.00
Birmingham	13.50	22.50	27.00	32.00
Boston	14.00	*28.00*	*42.50*	*47.00*
Chicago	12.00	.....	42.00	45.00
Cincinnati	16.00	24.00	35.00	37.00
Cleveland	12.00@14.00	21.00@28.00	33.00	36.00
Dallas	14.50	17.50	.....	29.50
Denver	9.00@10	25.00	.....	.....
Detroit	15.00	25.00	35.50	37.50
Kansas City	14.00	.....	35.00	37.50
Los Angeles	*9.00*	26.50	.....	.....
Minneapolis	10.50	30.00	.....	.....
Montreal	28.00	.....	.....	.....
New Orleans	**13.00**	.....	35.00	42.00
New York	13.00	26.00	45.00	50.00
Philadelphia	16.00	.....	40.00	45.00
Pittsburgh	*15.00*	22.00	41.00	58.00
St. Louis	14.00	22.00	35.00	35.00
San Francisco	14.00	.....	45.00*	.....
Seattle	14.00	.....	.....	48.50

*2½x8½x4-in.

LIME—Prices delivered by dealers to job:

	Hydrated, per Ton — Finishing	Hydrated, per Ton — Common	Lump, per Barrel — Finishing	Lump, per Barrel — Common
Atlanta	$20.00	$12.50	.....	$2.50†
Baltimore	22.00	14.00	.....	2.25†
Birmingham	30.00	17.50	.....	2.00†
Boston	22.00	14.50	$4.00*	3.10*
Chicago	15.00	14.50	15.00‡	15.00‡
Cincinnati	13.05	10.70	.....	.....
Cleveland	12.00	10.00	2.50†	2.50†
Dallas	20.00	.....	2.35†	.....
Denver	*30.00*	23.75	3.80*	3.00†
Detroit	14.00	12.00	1.75†	1.65*
Kansas City	19.00	18.00	**2.25**†	2.00†
Los Angeles	26.00	18.00	2.00†	2.00†
Minneapolis	25.50	21.00	.....	1.70†
Montreal	18.00	.....	10.00	.....
New Orleans	25.00	15.00	2.65†	1.95†
New York	18.00	15.50	4.10*	3.15*
Philadelphia	18.00	15.00	18.00‡	14.00‡
Pittsburgh	13.50	13.00	4.25*	2.75†
St. Louis	22.00	18.00	.....	15.00‡
San Francisco	20.00	20.00	.....	1.85†
Seattle, paper sacks	35.00	24.00	.....	2.80†

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

LIMESTONE—Mill blocks, f.o.b. siding, per cu.ft.:

New York: Rustic buff, $1.42; Standard gray, $1.47; Standard, $1.57; Selected gray, $1.57; Selected buff, $1.67.
Boston: Rustic buff, $1.45; Standard, $1.58; Selected buff, $1.71.
Pittsburgh: Rustic buff, $1.03; Standard, $1.18; Selected buff, $1.28.

SLATE—Roofing, f.o.b. quarry, Bangor, Pa., net, per square;

No. 1 Clear	$9.00@$14.00
No. 1 Ribbon	7.50@ 10.25
Medium Clear	8.00@ 10.50

Road and Paving Materials

PAVING STONE—Carload lots of granite blocks, 4x8x4-in., dressed, f.o.b.:

Atlanta	$3.00 per sq.yd.
Baltimore	3.00 per sq.yd.
Boston	135.00 per M.
Chicago, 5 in	3.25@3.90 per sq.yd.
Cincinnati	110.00 per M.
Cleveland	*90.00@100.00* per M.
Detroit, 5 in	3.00 per sq.yd.
Kansas City	3.75 per sq.yd.
Minneapolis, 4½ in	2.80 per sq.yd.
Montreal	104.75 per M.
New Orleans	2.80 per sq.yd.
New York, 5 in	120.00 per M.
Philadelphia	125.00 per M.
St. Louis, 5 in	3.50 per sq.yd.

Current Prices of Construction Materials

Road and Paving Materials—Continued

WOOD-BLOCK PAVING—Prices, f.o.b., in carloads:

	Size of Block	Treatment	Per Sq.Yd.
Atlanta	3½	16	$2.25
Boston	3½	16	2.25
Chicago	3½	12	1.80@2.00
Kansas City	3½	16	2.50
Minneapolis	3½	16	2.50
Montreal	3	16	2.63
New Orleans	3½	16	2.30
New York	3½	16	2.50
St. Louis	3½	16	2.10

FLAGGING—Alongside dock, New York, per sq.ft.:
Manhattan and Bronx, 4 ft. wide.... $0.24 Queens, 5 ft. wide..... $0.26

CURBING—Prices per lin.ft., f.o.b., cutting charges not included:
New York: Bluestone, f.o.b. barge, 5x16-in., rough, 90c.
Birmingham: Granite, 5x16-in., 50c.; 6x20-in., 60c.; roundings, 5x16-in., 65c.; 6x20-in., 80c.
St. Louis: Class "B" straight, 5x16-in., 75c.; roundings, $1.05@$1.30.

ASPHALT—Paving asphalt, f.o.b., per ton. Packages are 350-lb. bbls. or 425-lb. drums, in carload lots:

	Packages	Tank-car or -boat
Atlanta	$18.40	**$15.40**
Baltimore (f.o.b. refinery)	16.00	12.00
Birmingham (f.o.b. refinery)	.....	**16.50**
Boston	22.00	17.50
Chicago	22.50	18.30
Cincinnati	.....	12.00
Cleveland	*18.75*	*15.50*
Dallas	20.00	.....
Denver	**40.00**	.....
Detroit	16.68	12.43
Kansas City (f.o.b. refinery)	16.00	11.00
Los Angeles (f.o.b. refinery)	**18.00**	**12.00**
Maurer, N. J. (Bermudez)	.....	25.00
Maurer, N. J. (Trinidad)	.....	21.00
Minneapolis (f.o.b. Twin Cities)	23.10	18.10
Montreal	*17.00*	*13.00*
New Orleans	24.00	21.00
New York (f.o.b. refinery)	16.00	12.00
Philadelphia	16.00	12.00
Pittsburgh	24@26	14@18
St. Louis	20.50	16.50
San Francisco (f.o.b. refinery)	18.00	12.00
Seattle	21.40	18.00

ROAD OILS—Prices, f.o.b., in tank cars, 8,000 gal. minimum, 45% asphalt, per gal:

New York	$0.035
Birmingham	.06
St. Louis	.04
Dallas	.05

Iron and Steel

PIG IRON—Furnace, per gross ton:

Birmingham, No. 2 fdry., silicon, 1.75@2.25	$12.00
Pittsburgh, basic	*16.00*

STRUCTURAL STEEL—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill, beams and channels, 3 to 15 in; angles 3 to 6-in., ¼-in. thick; tees, 3-in. and larger; and plates, ¼-in. thick and heavier:

Birmingham	$1.70	New York	$2.35
Chicago	2.65	Pittsburgh	*1.60*
Cleveland	2.95	St. Louis	3.25
Dallas	3.90	San Francisco	2.90

BARS, CONCRETE REINFORCING—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill, on bars rolled from billets, size ¾-in.:

Birmingham	$1.75	New York	$2.35
Chicago	2.00	Pittsburgh	1.60
Cleveland	1.75	St. Louis	2.50
Dallas	**2.50**	San Francisco	2.50

EXPANDED METAL LATH—Per 100 sq.yd., painted, delivered to job, in lots under 200 sq.yds:

Lb. per Sq.Yd.	New York	Birmingham	Chicago	St. Louis	Dallas	San Francisco
2.2	$13.00	$17.50	$10.10*	$16.00@**$19.00**	$18.00	$21.50
2.5	14.00	18.50	10.90*	17.00@ **20.00**	19.50	22.50
3.0	15.50	20.50	12.25*	18.50@ **21.50**	.....	25.00
3.4	16.50	**22.50**	13.10*	19.50@ **22.50**	24.00	27.00

*More than 200 sq.yds.

WIRE REINFORCEMENT FOR CONCRETE—Plain, per 100 sq.ft., 4 in. x 4 in. triangle mesh; manufacturers' quotations are in carloads at mills; dealers' are delivered in lots of 10,000 sq.ft. or over:

Style Number	Weight in Pounds per 100 sq.ft.	Pittsburgh Mill	Chicago District Mill	Del. From Warehouse: New York	St. Louis	Dallas	San Francisco
032	22	$0.94	$0.87	$1.32	$1.30	$1.63	$1.22*
049	28	1.20	1.11	1.67	1.70	2.00	1.55*
068	30	1.47	1.35	2.07	2.10	2.25	1.91*
093	45	1.88	1.74	2.65	2.65	2.86	2.46*
126	57	2.33	2.15	3.28	3.30	3.52	3.03*
153	68	2.78	2.56	3.92	3.95	4.20	.....
180	78	3.19	2.95	4.49	4.35	4.80	.....

*F.o.b.

STEEL SHEETS—Prices per 100 lb. for base sizes, delivered from warehouse, except in Pittsburgh, where prices are f.o.b. mill:

	Blue Annealed No. 10*	Black No. 24	Galvanized No. 24
Chicago	$2.85	$3.30	$3.85
Cleveland	3.00	3.60	4.00
New York	2.65	3.50	4.00
Pittsburgh	1.85	2.15@2.25	2.75@2.80
St. Louis	3.45	3.80	4.35
San Francisco	3.65	4.15	4.65

*Light plates.

WIRE ROPE—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River.

	Base
Cast steel round strand rope	20%
Galvanized iron rigging and guy rope (add to list)	12½%
Galvanized steel rigging and guy rope	7½%
Plow steel round strand rope	35%
Round strand iron and iron tiller	5%
"Special Steel" and extra strong cast steel, round strand rope	27½%

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas. Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

RIVETS—Structural rivets, round head, ½-in., full kegs, per 100 lb., delivered from warehouse, except in Pittsburgh, where prices are f.o.b. mill:

Chicago	$4.00
Dallas	5.00
Denver	4.65
New York	4.00
Pittsburgh	2.75
St. Louis	4.15
San Francisco	5.50
Seattle	5.50

STEEL SHEETPILING—Base price, f.o.b., Pittsburgh, for large mill lots, per 100 lb..... $1.90

TERNE PLATE—I C, 8-lb. coating, 20x28-in., f.o.b., Pittsburgh mill:
Per package..... $10.30

SHIP SPIKES—Per 100 lb., black, from dealers' warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

	½-In.	⅝-In.	¾-In.
San Francisco	$5.50	$5.05	$4.90
Seattle	7.75	5.65	5.50

Pittsburgh mill base in lots of 200 kegs or more, $2.90 per 100 lb.

WIRE NAILS—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

Pittsburgh Mill	Birmingham	Chicago	St. Louis	Dallas	San Francisco	Montreal
$1.95@$2.00	$2.65	$3.30	$2.40	$3.50	*$2.90*	$4.95

SCRAP—The prices following are, f.o.b., per ton, paid by dealers:

	New York Per Gross Ton	Chicago Per Gross Ton	Detroit Per Gross Ton
No. 1 railroad wrought	$8.25	$8.00@$8.50	.....
Stove plate	3.75@4.50	7.50@ 8.00	$5.25
No. 1 machinery cast	*7.00*	10.50@ 11.00	7.50*
Machine shop turnings	2.00	3.75@ 4.25	**4.75**
Cast borings	2.25	3.75@ 4.25	4.25
Railroad malleable	7.50	9.50@ 10.00	9.50
Re-rolling rails	6.00	10.50@ 11.00	9.00
Misc. steel rails	.....	8.50@ 9.00	*9.50*
Heavy melting steel, No. 1	**5.00**	8.50@ 9.00	*8.50*
Iron and steel pipe	6.00	3.50@ 4.00	.....

*Net ton.

FREIGHT RATES—The following freight rates per 100 lb., effective May 20, 1930, apply on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc.:

Atlanta	$0.58*	Detroit	$0.265†
Baltimore	.27†	Kansas City	.695†
Birmingham	.58*	New Orleans	.67*
Boston	.40†	New York	.33†
Buffalo	.235†	Pacific Coast (all rail)	1.15‡
Chicago	.34†	Philadelphia	.29†
Cincinnati	.265†	St. Louis	.39†
Cleveland	.185†	St. Paul	.60*
Denver	1.15‡		

*36,000 lb. †40,000 lb. ‡60,000 lb.

Railway Materials and Supplies

STEEL RAILS—Per gross ton, f.o.b.:

	Pittsburgh	Birmingham	Chicago
Standard openhearth rails	$43.00	$43.00	$43.00
Light rails, 25 to 45 lb.	34.00	36.96	34.00@36.00
Re-rolled rails	24.00@28.00	.....	34.00@36.00

RAILWAY TIES—For fair-sized orders, f.o.b., the following prices per tie hold:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
New York	Long-leaf sap pine, untreated	$1.00	$1.20
	Creosoted—prices on application.		
Birmingham	White oak, untreated	**.95**	*1.10*
	White oak, creosoted	1.50	*1.60*
	Southern pine, untreated	.50	1.00
	Southern pine, creosoted	1.10	**1.45**
Chicago	White oak, untreated	1.21	1.75
	Oak, empty cell, creosoted	1.61	2.34
	Oak, zinc treated	1.49	2.19
	Southern pine, creosoted	1.38	1.94
St. Louis	White oak, untreated	.90	**1.50**
	Red oak, creosoted	*1.20*	1.80
	Sap pine or cypress, untreated	.70	**1.25**
San Francisco	Douglas fir, green, untreated	.51	.73
	Douglas fir, empty cell, creosoted	*1.40*	*1.79*
Montreal	Birch or maple, untreated	.75@1.25	.75@1.25
	Birch or maple, creosoted	1.20@1.30	1.50@1.60

Current Prices of Construction Materials

Railway Supplies—Continued

TRACK SUPPLIES—Prices per 100 lb. f.o.b., for large mill lots, at Pittsburgh, Birmingham and Chicago, together with warehouse prices at other places named:

	Pittsburgh	Chicago	Birmingham	St. Louis	San Francisco
Standard spikes, ⅝-in. and larger	$2.70	$2.80	$2.70	$3.65@$3.75	$4.10
Track bolts	3.80	3.80	3.70	4.50@ 4.75	5.10
Standard section angle bars, splice bars or fish plates	2.75	2.75	*3.00**	.....	.....
Tie plates	1.95	1.95	2.07½	.....	.....

* At warehouse.

Pipe

WROUGHT STEEL PIPE—Discounts from standard lists for delivery from warehouse, except at Pittsburgh, where prices are f.o.b. mill:

	1 to 3-In. Butt Weld		3½ to 6-In. Lap Weld	
	Black	Galvanized	Black	Galvanized
Chicago	57.3%	44.8%	53.9%	41.4%
Cleveland	53.3%	42.3%	50.8%	37.8%
New York	56.14%	43.6%	52.72%	40.18%
Pittsburgh	64%	52.5%	61%	49.5%
St. Louis	51%	38%	48%	35%

CAST-IRON PIPE—Prices per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots (250 tons and under) of pipe:

	4-In.	6-In. and Over
Birmingham mill	$38.00@$39.00	$35.00@$36.00
Burlington (N. J.) mill	37.00@ 38.00	34.00@ 35.00
Chicago	46.00@ 47.00	43.00@ 44.00
New York	40.00	37.00
Pittsburgh	46.50@ 47.50	43.50@ 44.50
St. Louis	45.00@ 46.00	42.00@ 43.00
San Francisco	48.00@ 49.00	45.00@ 46.00

Gas pipe and Class A, $3.00 per ton extra.

SEWER PIPE—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

	6-In.	8-In.	12-In.	18-In.	24-In.	30-In.	36-In.
Atlanta	$0.105	$0.175	$0.315	.....	.....	.....	.....
Baltimore	.10	.30	.58	.....	$1.93	.....	$6.50
Birmingham	.135	.225	.405	$0.85	1.625	$3.18	4.38
Boston	.18	.28	.55	1.35	2.38	3.95	5.90
Chicago	.18	.28	.54	1.25	2.25	4.75	6.00
Cincinnati	.135	.21	.405	1.125	2.025	3.672	5.74
Cleveland	.189	.294	.567	1.35	2.43	4.824	7.38
Dallas	.23	.325	.586	1.106	1.95	3.68	5.00
Denver	.161	.23	.414	.816	1.44	.....	.....
Detroit	.18	.28	.6075	1.50	2.70	5.12	.....
Kansas City	.21	.33	.52	1.22	1.90	3.60	.....
Los Angeles	.217	.2825	.4985	1.1865	2.034	3.93	9.00
Minneapolis	.155	.24	.50	1.15	1.85	3.45	4.60
Montreal	.30	.45	.75	1.95	2.60	.....	7.20
New Orleans	**.18**	**.30**	**.54**	**1.02**	**1.95**	.....	.....
New York	.17	.265	.52	1.30	2.34	4.47	6.86
Philadelphia	.0945	.147	.297	.80	1.44	2.304	3.28
Pittsburgh	.1575	.245	.54	1.25	2.25	4.68	7.17
St. Louis	.1295	.235	.423	1.05	1.80	3.20	4.40
San Francisco	.21	.30	.54	1.26	2.16	3.60	5.40
Seattle	.22	.30	.54	1.26	2.16	3.50	5.50

CLAY DRAIN TILE—Prices delivered by dealers, per 1,000 lin.-ft.:

Size, In.	New York	Birm'ham	Pittsburgh	St. Louis	Dallas	San Fran.	Seattle
4	$43.00*	$50.00	$80.00	$50.00	$80.00	$67.50	$60.00
6	78.00*	85.00	110.00	85.00	110.00	112.50	112.00

*F.o.b.

Miscellaneous

LINSEED OIL—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... $0.096 Chicago.... $0.098 Minneapolis... **$0.107**

WHITE AND RED LEAD—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.25; White, in oil, $13.25; Red, dry, $13.25; Red, in oil, $14.75.

CHEMICALS—Water, sewage treatment, road work, round lots in the New York market:

Sulphate of aluminum, in bags, per 100 lb	$1.25@$1.40
Sulphate of copper, in bbl., per 100 lb	3.70@ 4.00
Soda ash, 58%, in bags, per 100 lb	1.15@1.17½
Chlorine, cylinders, per lb	.04@ .06
Bleaching powder, in drums, f.o.b. works, per 100 lb	2.00@ 2.10
Calcium chloride, flaked, in drums, f.o.b. works, per ton	22.75

MANILA ROPE—The number of feet per pound for the various sizes is as follows: ⅜-in., 7-ft.; 6-in.; ½-in., 6-ft., 1-in.; ¾-in., 4-ft., 5-in.; 1-in., 3-ft., 8-in.; 1¼-in., 2-ft., 5-in.; 1½-in., 1-ft., 8-in. Following prices are quoted by dealers per pound or ¾-in. and larger:

Atlanta	**$0.25**	Kansas City	*$0.24*
Baltimore	.225	Los Angeles	.175
Birmingham	.25	Minneapolis	.19
Boston	.20	Montreal	.185
Chicago	.17	New Orleans	**.22**
Cincinnati	.21	New York	.17
Cleveland	.21	Philadelphia	.21
Dallas	.26	St. Louis	**.17@.175**
Denver	.20	San Francisco	.175
Detroit	.185	Seattle	.175

BUILDING PAPER—Black, 50-lb. per roll of 500 sq.ft., in carloads, f.o.b., producing point $2.16

SLATERS FELT—In carloads, per roll, f.o.b., producing point $0.79

ROOFING MATERIALS—Prices, f.o.b. New York, delivered by dealers to contractors, in carloads:

Asphalt felt, per 100 lb	*$2.50*
Tar felt, per 100 lb	*2.50*
Asphalt coating, per gal	.34½
Tar pitch, in 350 lb. barrels, per ton	28.00

PREPARED ROOFINGS—Prices, delivered by dealers to contractors, in carloads, f.o.b. New York, per square:

Single shingles, slate finish, sufficient to cover 100 sq.ft.	$6.50
Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label	6.25
Slate surfaced roofing in rolls weighing 85 to 90 lbs	2.50

WINDOW GLASS—Discounts from latest jobbers' window-glass list, dated Sept. 15, 1928, at New York warehouse:

	Single Thickness		Double Thickness	
	A Quality	B Quality	A Quality	B Quality
First 3 brackets	89%	91%	88%	90%
Larger sizes	88%	90%	88%	90%

EXPLOSIVES—Price per pound for dynamite delivered in small lots—under 200 lb.:

	Gelatin 40%	Gelatin 60%		Gelatin 40%	Gelatin 60%
Atlanta	$0.22	$0.245	Los Angeles†	$0.1725	$0.1925
Baltimore	.215	.2375	Minneapolis	.20	.225
Birmingham	.135	.152	Montreal	.20	.24
Boston	.225	.25	New Orleans	.195	.22
Chicago	.195*	.22*	New York	.245‡	.2675‡
Cincinnati	.22	.245	Philadelphia	.215	.24
Dallas	.2125	.2475	St. Louis	.215	.235
Denver, f.o.b.	.19	.2125	San Francisco	.155	.18
Kansas City, Mo.	.2025	.2225	Seattle	.1525	.175

*Quantities above 500 lb. but less than a ton. †San Fernando Arsenal. ‡Special gelatin in case lots.

Lumber

Prices Are Per Thousand Feet, Board Measure

New York—Timbers, No. 1 Common, rough, delivered to contractor at site of job, in Manhattan, in 20 ft. lengths and under, per M. ft., b.m.:

	Long-leaf Yellow Pine	Douglas Fir
3x4 to 8x8	$47.50	$30.00
3x10 to 10x10	55.00	31.50
3x12 to 12x12	65.00	32.50
3x14 to 14x14	72.50	35.50

Chicago—Timbers, No. 1 Common, rough, per M. ft. b.m., f.o.b., in carloads For delivery to job from stock, in truckloads, add $10 per M. ft., b.m.:

	20 Ft. and Under Long-Leaf Yellow Pine	Up to 32 Ft. Douglas Fir
3x4 to 8x8	$39.50	$37.50
3x10 to 10x10	47.00	37.50
3x12 to 12x12	58.00	37.50
3x14 to 14x14	71.00	38.50

San Francisco—Douglas fir, No. 1 Common, rough, at yards. For delivery to contractor at site of job, add $5 per M. ft., b.m.:

	10-16-18 and 20 Ft.	22 and 24 Ft.
3x3 and 4	$30.00	$32.00
3x6 and 8	30.00	32.00
3x10 and 12	30.00	32.00
3x14	33.00	34.00

Other Cities—Delivered by dealers, No. 1 Common, rough, per M. ft., b.m.:

	8x8-In. x 20 Ft. and Under				3x12 to 12x12-In. 20 Ft. and Under	
	Pine	Fir	Hemlock	Spruce	Pine	Fir
Atlanta	$50.00	.....	.....	.....	$65.00	.....
Baltimore	36.00	$50.00	$53.50	$61.75	75.00	$50.25
Birmingham	46.00	.....	.....	.....	76.00	.....
Boston	51.00	**46.00**	47.00	**48.75**	57.00	**43.00**
Cincinnati	42.50	55.00	.....	.....	52.50	52.50
Cleveland	54.00	54.00	.....	.....	45.00	49.00
Dallas	55.00	57.50	55.00	55.00	55.00	50.00
Denver	.....	*34@50*	50.00	.....	.....	**49.00**
Detroit	53.00	51.00	.....	.....	65.00	51.00
Kansas City	36.00	36.50	36.50	.....	55.00	42.00
Los Angeles	.....	43.50	.....	.....	.....	*42.50*
Minneapolis	.....	46.25	.....	.....	.....	46.25@47.75
Montreal	.....	.....	.....	40.00	40.00	.....
New Orleans	**40.00**	**40.00**	.....	**45.00**	**65.00**	**60.00**
Philadelphia	48.00	42.00	41.00	46.00	58.00	42.00
Pittsburgh	53.00	57.00	65.00	66.00	43@57	57@60
St. Louis	47.00	*38.00*	39.00	.....	56.00	*39.00*
Seattle	.....	18.00	.....	.....	.....	17.00

	1x10 In. x 16 Ft. and Under			2x10 In. x 16 Ft. T. & Gr.	
	Pine	Fir	Hemlock	Pine	Fir
Atlanta	$55.00	.....	.....	*$37.50*	.....
Baltimore	54.00	$44.00	$43.75	.....	.....
Birmingham	40.00	.....	.....	55.00	.....
Boston	46.00	**41.00**	42.00	48.00	**$45.00**
Cincinnati	45.00	47.50	.....	35.00	45.00
Cleveland	65.00	54.00	.....	42.00	54.00
Dallas	60.00	.....	.....	55.00	.....
Denver	.....	*26.00*	36.00	.....	*45.00*
Detroit	49.00	45.00	.....	46.00	45.00
Kansas City	45.00	35.00	35.00	35.00	33.00
Los Angeles	40.50	40.50	.....	.....	48.50
Minneapolis	65.00*	40.00	.....	45.00*	39.00
Montreal	45.00	50.00	40.00	.....	55.00
New Orleans	**40.00**	**40.00**	.....	54.00	48.00
Philadelphia	50.00	42.00	40.00	53.00	42.00
Pittsburgh	40.00	47.00	55.00	40.00	50.00
St. Louis	**39.50**	39.00	39.00	**42.50**	**41.00**
Seattle	.....	17.50	.....	.....	16.00

*Northern Pine, No. 2 Com.

PILES—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Barge	Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.12	$0.165
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	.165	.215
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	.19	.235
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	.225	.345
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	.2425	.295
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	.305	.395
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	.345	.435

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	*Project*	*Cost*	*Status*
Sewers			
Dallas	Sewage disposal	$1,700,000	Bids asked
Railways			
Oregon	Truck work	1,000,000	Contract
Federal Government			
Washington	Archives building	8,750,000	Bids asked for clearing site
Topeka (Kan.)	Post office	1,065,000	Proposed
Factories and Mills			
Montreal	Plant	1,000,000	Proposed
Power Plants			
Washington	Power plant	5,000,000	Proposed
Buildings			
Pittsburg	Church	1,000,000	Proposed
Long Branch (N. J.)	Hospital	1,000,000	Bids asked
Washington	Office	1,250,000	Contract
San Francisco	School	1,500,000	Proposed
Cambridge (Mass.)	Nautical School	1,500,000	Proposed
Jersey City	School	2,000,000	Proposed
New York	Stores and apartments	1,000,000	Proposed
Houston (Tex.)	Railroad station	5,000,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Los Angeles—City Council plans 6 in. water mains in Van Nuys and Bradley Avenue Improvement Dist. $35,000.

Conn., Danbury—City, preparing plans and takes bids about September, waterworks system, incl. reservoir, dam, filtration plant, necessary c.i. pipe and pipe lines. Est. $700,000. Hazen & Everett, 25 West 43rd St., New York, engrs. Noted Feb. 19.

Conn., Hartford — Metropolitan Water Dist., 750 Main St., plans 24 in. transmission line, appurtenances and general equipment, in connection with 220 ft. reservoir for East Hartford water system. $500,000.

Conn., Rocky Hill—Metropolitan Water Dist., waterworks, watermains from Hartford. $40,000. C. M. Saville, c/o Metropolitan Water Dist., 750 Main St., Hartford, engr.

Ill., Mounds—City, preliminary surveys by Russell & Axon, engrs., 6200 Easton Ave., St. Louis and McDaniel Bldg., Springfield, Mo. municipal light and power plant and water works improvements, incl. distribution system, elevated tank, reservior, pumping station.

Ind., Fairmont—Town Board plans new waterworks, pumps, equipment. $15,000.

Ind., Summitville—City Council, waterworks. $25,000.

Ia., Sioux City—Preliminary plans 100,000 gal. rein.-con. storage reservoir in Stone Park. **Maturity spring 1932.**

Mo., Grandview—South Jackson County Water Co. plans waterworks system incl. 250,000 gal. storage tanks, mains, sub-mains. $150,000. C. A. Haskins, 822 Finance Bldg., Kansas City, engr.

Mo., Waynesville — Bids soon waterworks system. $21,000 voted.

N. J., Paterson—Passaic Water Comn., 156 Ellison St., preliminary plans 51 in. water pipe line, through portion of West Side Park. $15,000. Private plans.

Okla., Oklahoma City—Preliminary plans waterworks extension in southern section. $120,000. L. M. Bush, City Hall, engr.

Pa., Glenfield—Boro, 218 Center St., F. W. Schneider, secy., preliminary surveys waterworks and sewerage systems. $50,000. Engineer not selected.

Pa., Torrence—Bd. Comrs. Torrence State Hospital plans impounding dam. Institution site. $310,000. J. N. Chester, Clark Bldg., Pittsburgh, engr.

Tenn., Ashland City—City, c/o S. A. Marble, deep well supply, 3 mi. 2- to 8-in. mains. J. B. McCrary Eng. Corp., 1408 Citizens and Southern Bank Bldg., Atlanta, Ga., Engrs. Noted July 24.

Ont., Galt—City, plans 10,000 ft. 6 in. c.i. water mains, with valves, hydrants, earth trenching, etc., in Manchester subdivision, $16,000. W. H. Fairchild, Hydro Bldg., engr.

Ont., Orillia—Orillia Water & Light Comn., plans drilling artesian or deep wells to supply 2 (Imperial) m.g.d.c. water supply. $30,000. James, Proctor & Redfern, 36 Toronto St., engrs. Noted July 30.

Ont., Preston—Town, plans increasing water supply, incl. new wells, and installing pumps. $15,000. James, Proctor & Redfern, 36 Toronto St., Toronto, engrs.

BIDS ASKED

Calif., Coalinga—E. J. McCroskey, city clk. taking new bids furnishing installing bronze fitted horizontal centrifugal pump. Former bids cancelled due to irregularities in specifications.

Mass., Southampton—Aug. 7, by Bd. Water Comrs., Town Hall, 32,700 lin.ft. 6 and 8 in. c.i. water pipe. Est. exceeds $15,000. Tighe & Bond, Holyoke, engrs.

Nev., Battle Mountain—Aug. 17, by Bd. Comrs. Lander Co., Austin, drilling, equipping well with pumping plant, steel water plant, mains, valves and hydrants. H. R. Lemarie, Battle Mountain, engr.

N. J., Paterson—Aug. 17, at office Passaic Valley Water Comn., 156 Ellison St., furnishing, installing hydraulic turbine generator equipment. W. E. Fuller & F. A. Barbour, engrs.; adv. E.N.-R. Aug. 6.

N. Y., Brooklyn — Aug. 11, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Ashland, Boynton, Schenectady, Bay Ridge, 10th Ave., Lake, 95th, East 16th, East 26th, East 48th, East 91st, West 12th and West 13th Sts., Bergen, Boreum, Coyle, Pine, Prospect, 12th, 52nd, 54th, 57th, 67th and 68th Sts.

N. Y., Long Island City—Aug. 11, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Tyron Rd., Utopia Parkway, Union Turnpike, Hanson Court, 214th Pl., 35th, 24th, 30th, 68th Aves., 25th, Manse, Penrod, 66th, 68th, 84th, 85th, 91st, 92nd, 93rd, 100th, Jordon, 168th and 193rd Sts., Queens Boro.

Tex., Corpus Christi — Sept. 10 (extended date), at office T. Koester, city secy., rehabilitating La Fruta Dam on Lake Lovenskiold. R. J. Cummins and H. E. Elrod, 1105 Nixon Bldg., Corpus Christi, or 727 Bankers Mortgage Bldg., Houston, consult. engrs. Noted July 16.

Wash., Yakima — City Council takes bids about Aug. 3, 3,980 ft. 12 in., 38,130 ft. 8 in. and 40,385 ft. 6 in. water pipes and fittings, 10,079 ft. 1 in. and 22,512 ft. ¾ in. copper pipe. $110,000. Noted July 16.

Ont., Hamilton—Aug. 19, by W. L. McFaul, city engr., superstructure 135 x 281 ft. buff pressed brick filtration plant. Total est. $1,000,000. Noted Sept. 25.

CONTRACTS AWARDED

Ark., Magnolia—Agriculture and Mechanical College, C. A. Overstreet, pres., 435 ft. 16 in. gravel wall and well guaranteed to produce 150 g.p.m. deep well pump, 20 hp. motor, to Layne-Arkansas Well Constr. Co., Stuttgart; 25,000 gal. tank on 75 ft. tower, concrete found., to Pittsburgh-Des Moines Steel Co., 10th and Tuttle Sts., Des Moines, Ia.

Mass., Belchertown—Commonwealth of Massachusetts, standpipe, to Chicago Bridge & Iron Wks., 250 Stuart St., Boston. $5,090. Noted June 4.

Mass., Braintree—Town, 1 story, brick pumping station, to C. A. Batson, 26 Arlington St., Brockton. Est. $15,000. Noted July 16.

N. J., Paterson—Passaic Valley Water Comn., 156 Ellison St., constructing industrial service distribution mains and appurtenant work, to Lock Jint Pipe Co., 150 Rutlidge Ave., East Orange. Noted June 25.

N. Y., Inlet—Inlet Water Dist., E. A. Simmons, ch., water supply Contracts 1 and 2 on state forest preserve to D. V. Palmer and A. H. Stowell, 204 Seitz Bldg., Syracuse; and work other than in Forest Preserve Contr. 3, to Britting & Stanz, Inc., Williamsville. Est. $80,000.

Wash., La Conner—City Comrs., water distribution system, incl. 200,000 gal. reservoir, 8 x 10 ft. chemical house, 51 x 29 ft. concrete filter structure, 26,500 ft. 6 in. steel pipe, 21,845 ft. 6- to 8-in. c.i. pipe, to Godfredson & Tetz, West Lynn, Ore., $31,410. Noted June 11.

Wash., Snohomish—City Comrs. new dam and headwater system on Upper Pilchuck River, to Snohomish Constr. Co., Snohomish, $15,160.

SEWERS

PROPOSED WORK

Ala., Birmingham—Jefferson Co., W. D. Bishop, pres., County Comn., rebuilding sewage disposal plants at Bessemer and Ensley. C. J. Rogers, co. engr.

Ariz., Tucson—City, 6 and 8 in. tile or concrete sewer lines in Rincon Court, Mable and Helen Sts. and 8 avenues. P. E. Fernald, Tucson, engr.

Ark., Glenwood—City Council plans sewerage and waterworks systems. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Calif., Los Angeles—For 7,300 lin.ft. 12- to 48-in. concrete storm drains, 1st St. between Broadway and Los Angeles Sts. $60,000. L. W. Armstrong, City Hall, ch. storm drain engr.

Calif., Redlands—City Council sewage disposal plant, reduction plant, sedimentation tanks. To exceed $25,000. G. S. Hinckley, city engr.

Conn., Mystic—Mystic Oral School, W. J. Tucker, supt., plans sewerage disposal plant. $25,000-$40,000. Payne & Keefe, 231 State St., New London, archts. Noted June 18.

N. J., Clifton—Bd. City Council, storm sewer in East Clifton and Lexington Aves. $25,000. **Maturity probably soon.** J. L. Fitzgerald, city engr.

N. J., Linden—Bd. City Council, City Hall, municipal sewage disposal plant. $25,000. Project in abeyance. **Maturity in October.** Engineer not appointed. Noted July 2.

N. J., North Bergen—Bd. Twp. Comrs., Township Hall, sanitary sewers in East Durham Sect. $25,000 or more. R. Glenn, twp. engr. **Maturity probably in spring 1932.** Noted July 2.

See proposal advertising on page 95

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LEADITE

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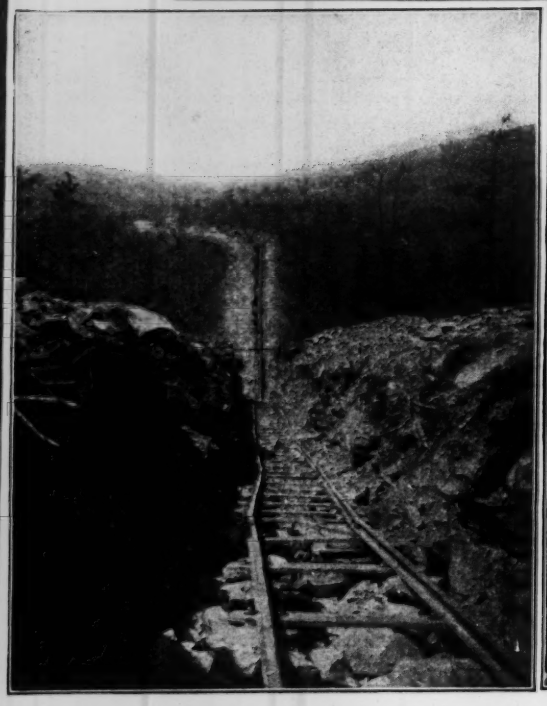

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Sewers (Continued)

N. J., Somerville—Bd. Boro Council, Boro Hall, municipal sewage disposal plant. $25,000. Engineer not appointed.

N. Y., Ardsley—Village bids probably late in August, sewerage system, in connection with Saw Mill River Valley Trunk Sewer. Noted June 18.

N. C., Winston-Salem—City surveys, extending sewers in Sprague, Waughton and Younttztown Sect. $100,000.

N. D., Fargo—By-pass sewerage system. $200,000. C. O. Jorgenson, city aud.

O., Kent—City, plans rebuilding city sewage disposal plant, installing all new equipment, increasing present capacity. $75,000. A. F. Ranney, Kent, engr.

Okla., Oklahoma City—For Virginia Ave. Sanitary Relief Sewer, 13,600 ft. 24- to 48-in. rein.-con. and vitr. clay pipe. $70,000. L. M. Bush, city engr.

Pennsylvania—West View Boro, H. P. McKown, Boro Bldg., engr., Millvale, S. H. Burns, 215 Williams St., engr., Ross Twp., McCully Eng. Co., Berger Bldg., Pittsburgh, engr. and Shalet Twp., F. G. Ross, 309 4th Ave., Pittsburgh, engr., plans trunk sewers. $200,000. West View plans election in November, to vote on their share of cost.

Pa., Erie—City Council plans storm and sanitary sewers in 2nd St. between Cherry and Poplar Sts., west to Liberty and south in Liberty St. to 11th St. $90,000. A. N. Aiken, City Hall, engr.

Pa., Polk—Polk State School, service lines and sewage disposal plant. $70,000. J. N. Chester Engineers, Clark Bldg., Pittsburgh, engr.

Tex., Houston—City, c/o W. E. Monteith, mayor, plans rein.-con. storm sewer on 20th Ave. from Yale to North Main Sts. $51,000; Conner St. in Montrose School Dist., $50,000; North Main St. from Winston to 20th Ave., $45,000; and Calhoun St. from Live Oak to St. Bernard Sts. $140,000. J. M. Nagle, Houston, city engr.

Tex., Longview—City, c/o Secretary, plans 7,488 ft. storm sewer pipe, 48,220 sq.yd. paving and 21,940 ft. curbing and guttering. $41,000. W. C. Albright, Longview, engr. Noted July 16.

BIDS ASKED

Kan., Dodge City—Aug. 19, by E. C. Hathway, city clk., sewers and Sewage disposal plant, Sect. 1—main and outfall sewers, incl. 6,700 ft. 27 in., 3,300 ft. 18 in., 2,400 ft. 10 in. and 400 ft. 8 in. sewers; Sect. 2—1,000 ft. 6 in. welded steel force main across Arkansas River; Sect. 3—complete sewage disposal plant, incl. 850 cu.yd. concrete. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

Ky., Louisville—Aug. 20, by Bd. Comrs. of Sewerage, Marion E. Taylor Bldg., Mill Creek Trunk Sewer in Taylor Blvd., Ashland Ave. and Peach Tree, St., incl. 6,875 ft. egg shaped rein.-con. sewer, 20 ft. 3 in. and 13 ft. 6 in. minimum dimensions, 12 ft. 6 in. and 8 ft. 4 in. inside diameter. W. M. Caye, technical engr.; ad. E.N.-R. Aug. 6.

Mass., Boston—See "Streets and Roads."

Mass., Walpole — Aug. 10, by Bd. Sewer Comrs., Town Hall, 16,000 ft. 15- to 30-in. main outfall sewer and appurtenances, along Neponset River from Walpole to East Walpole. Fay, Spofford & Thorndike, 44 School Sts., Boston, engrs.

N. Y., St. George—Aug. 12, by J. A. Lynch, pres. Richmond Boro, Boro Hall, sanitary sewers in Rhett Ave.

S. C., Greenville—Aug. 11, by Augusta Rd., North Gate and Parker, Water and Sewer Sub-District Comns., Emaxcee Bldg., McBee Ave., 98,000 ft. 6- to 15-in., 34,000 6- to 15-in. and 280 ft. 6- to 15-in. terra cotta and c.i. sewer lines, with all appurtenances, respectively. J. E. Sirrine & Co., Greenville, engrs.

Tex., Dallas—City, c/o E. Goforth, secy., takes bids about Aug. 15, sewage disposal plant, incl. 1 story, basement, 44 x 74 ft., pump and blower station; 34 x 54 ft. screen houses; 20 x 20 ft. pump station; 41 x 54 ft., administration building and laboratory, all foregoing brick, rein.-con., equipment, incl. two 36 ft. square detritors, 14 ft. deep; 2 primary clarifiers 100 ft. sq. 14 ft. deep; aeration tanks to cover 235 x 500 ft. erea 16 ft. deep; 5 final clarifiers, 105 ft. in diameter, 14 ft. deep, 4 digestor tanks, 85 ft. diam., 30 ft. deep and 6 air compressors. $1,700,000. Hawley, Freese & Nichols, Capps Bldg., Fort Worth, consult. engrs. Noted June 4.

CONTRACTS AWARDED

Ala., Tuscaloosa—City Comn., for 14 mi. concrete sanitary sewers to Jacobson & Mortonson, Hammon, La., $99,185. Excavation under way.

Ia., Pella—City Council, sewage disposal plant, incl., Imhoff tank, filter and secondary tank, auxiliary piping, to W. B. Carter, Sioux City, $32,270. Est. $45,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewer and surface water drain, West Roxbury Parkway, near Boston Line to A. Daddario, 48 Rockdale Et., Mattapan, $54,005.

Mass., Gardner—Commonwealth of Massachusetts, State House, Boston, sewage disposal system, at Gardner State Hospital. $25,000. Owner builds. J. J. Van Valkenburgh, Irving Sq., Framingham, engr. Noted June 11.

Mo., Kansas City—City Council, Sewers in Dist. 521, Division 6, to McGraw Constr. Co., 720 Baltimore St., $23,955.

New Jersey—Joint Meeting Cities of East Orange, Newark and Summit, Twps. Hillside, Maplewood, Millburn, and Union, Boro of Roselle Park, Village of South Orange, and Town of West Orange, City Hall, Newark, constructing Divs. A, B, C and D. Contract D, in Elizabeth to Northern States Contg. Co., 221 Elmora Ave., Elizabeth. $538,242. Noted June 18.

N. Y., Brooklyn—H. Hesterberg, pres., Brooklyn Boro, Boro Hall, sewer in Elmore Pl. and East 27th St. to Vaccaro & De LaSalla, $5,046 and $4,799 respectively—87th St. to R. Nazzaro, Inc., 7101 11th Ave., $1,867. Grand total $11,712. Noted July 9.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 21st St. to Pan Cpnstr. Co., $35,175; 74th St., to J. Picone Contg. Co., 102-09 217th Pl., $95,973—Nagy and Lawrence Sts., to Kennedy & Smith, Branford Ave., Flushing, $63,744, and $173,964 respectively—75th Rd. to Napolitan Constr. Co., 9218 Liberty Ave., Ozone Park, $3,722; Polhemus Ave., to Federico & Franzoise, Polhemus Ave. $28,505. Grand total $401,083. Noted July 2.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 153rd St. to Napolitano Constr. Co., 9218 Liberty Ave., Ozone Park, $9,242 and Long St. to Mannino & Pittari, 283 86th St., Brooklyn $63,235. Noted June 25.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Wickham, Addee, to Del Giacco, $1,191 and $753 respectively; Griswold Ave. to A. Casserta, $56,003. Grand total $57,947. Noted July 9.

O., Columbus—R. S. McPeak, acting dir. Service, 5,270 ft. 18- to 36-in. vitr. clay and 180 ft. 96 in. rein.-con. storm sewers Weber Rd. from Beulah Rd. to Grassmere Ave., to B. Canini, 297 Fletcher St. $21,567.

Okla., Tulsa—E. Rogan, city auditor, storm sewer in Meadow Brook Dist., to H. Frye, 111 Florence St., $35,640. Est. $39,210.

Pa., Phila.—Dpt. P. Wks., Bureau Engineering & Surveys, A. Murdock dir., City Hall Annex, Schedule A, filling in old sewer in Willow St., constructing new sewer in right-of-way through property of Reading Co.; outside lines Willow St. between Delaware River and New Market St., and Schedule 3, intercepting chambers and appurtenant work in Margaret St. from Frankfort Creek to Bermuda St., to E. Ventresco 6016 Ross St., $73,390 and $22,286 respectively; Schedule B, main effluent conduit in proposed Island Ave. and other city property, to J. and R. Lombardi, Real Estate Trust Bldg., $356,746. Grand total $452,422. Noted July 16.

S. D., Sanator—R. E. Woodworth, supt. State Sanitorium for Tuberculosis, sewage treatment plant and connecting sewers, to Pioneer Br. Co., Mitchell, $23,700. Noted July 2.

WASTE DISPOSAL

PROPOSED WORK

N. Y., New York—Dpt. Sanitation, Municipal Bldg., bids in fall, incinerator. Cromwell Ave. and 150th St. Noted July 9.

BIDS ASKED

Mass., Worcester—Aug. 15, by City, Mayor's Office, City Hall, incinerator plant and equipment, alternate 1 and 2 stack plants, ramp or crane. $260,000. Metcalf & Eddy, Statler Bldg., Boston, consult. engrs. Noted Dec. 25.

CONTRACTS AWARDED

N. J., Irvington (br. Newark)—Town Council, Town Hall, municipal refuse incinerator addition, Colt St., to Nye Odorless Incinerator Co., 50 East 42nd St., New York, $151,300. Noted June 18.

BRIDGES

PROPOSED WORK

California—Bd. Comrs. Los Angeles and Orange Counties, and cities of Long Beach and Seal Beach, plan vehicular bridge over mouth Alamitos Bay connecting Seal Beach and Long Beach. $140,000. E. C. Eaton, Los Angeles co. engr. Flood Control Dist.

Minn., Wabasha—Chicago, Milwaukee, St. Paul & Pacific R.R. Co., C. F. Loweth, ch. engr., Chicago, Ill., 390 ft. pontoon bridge over Mississippi River at Reads. $70,000.

N. J., Vleitown — Bd. Freeholders Somerset Co., Court House, Somerville, will not construct concrete bridge. $25,000. Project abandoned. O. Smith, Somerville, co. engr. Noted July 2.

BIDS DESIRED

Illinois—Aug. 25 (extended date), by State Dpt. P. Wks. & Buildings, Div. Hys. Springfield, 25 ft. rein.-con. slab bridge, Route 20, Sect. GR-B, Lake Co.—25 ft. rein.-con. slab bridge, Route 22, Sect. 23-RB—thirteen 33 ft. span rein.-con. girder bridge, retaining wall, Route 49, Sect. 144-H, both Cook Co.—raising, widening six 14 ft. and one 21 ft. span timber bridge, Route 78, Sect. 109-V-B, Carroll Co.—one 33 ft. and two 37 ft. span rein.-con. girder bridge, Route 95, Sect. 122-V-B Fulton Co.—one 45 ft., one 50 ft. and two 35 ft. span rein.-con. girder bridge, 2 rein.-con. substructures, 12 ft. rein.-con. box culvert, Route 143, Sect. 105-B—one 150 ft. and one 100 ft. span steel superstructures, Route 143, Sect. 105-C, both Saline Co.—rein.-con. substructure, fifteen 43 ft. I-beam approach spans on concrete piles, Route 148, Sect. 120-B—100 ft. steel superstructure, Route 148, Sect. 120-C, both Jefferson Co.—three 50 ft. span rein.-con. substructure, 5 rein.-con. girder approach spans, two 30 ft. span concrete substructure, two 30 ft. rein.-con. girder approach spans, Route 150, Sect. 133-B—one 115 ft. and one 80 ft. steel superstructures, Route 150, Sect. 133-C, both Alexander Co. F. T. Sheets, ch. engr. Noted July 9.

Illinois—Aug. 18, by State Dpt., P. Wks & Buildings, Div. Hys., Springfield, one 47 and four 33 ft. spans rein.-con. girder bridge, Route 4, Sect. 430-VB—widening one 36 ft. and two 33 ft. rein.-con. girder bridge, Route 5, Sect. 7-V—25 ft. rein.-con. slab bridge, Route 22, Sect. 23R-B—all Dist. 1, Cook Co.—seven 60 ft. spans rein.con. girder bridge, Route 9, Sect. 48-B, Dist. 4, Peoria Co.—25 ft. rein.-con. slab bridge and paving approaches, Route 20, Sect. GR-B, Dist. 1, Lake Co.—two 40 ft. spans rein.-con. girder bridge, Route 71, Sect. 115-B, Dist. 2, Lee Co.—raising and widening one 21 ft. and six 14 ft. spans bridge, Route 78, Sect. 109-VB, Dist. 2, Carroll Co.—two 40 ft. spans rein.-con. girder bridge, six 32 ft., three 20 ft. and two 20 ft. spans rein.-con. slab bridges, also 3 rein.-con. box culverts, Route 89-C, Sect. 105-B, Dist. 3, Marshall and Putnam Counties—one 33 ft., two 37 ft. spans rein.-con. girder bridge, Route 95, Sect. 122-VB, Dist. 4, McDonough Co.—three 45 ft. spans rein.-con. girder bridge, Route 100, Sect. 123-B, Dist. 8, Pike Co.—one 50 ft. and three 30 ft. spans rein.-con. girder bridges, Route 100, Sect. 124-B, Dist. 8, Calhoun Co.—80 ft. steel superstructure on rein.-con substructure, Route 104, Sects. 141-B and C.—45 ft. rein.-con. girder bridge, Route 124, Sect. 101-B—two 43 ft. spans and twelve 43 ft. spans with eleven 43 ft. I-beam approach spans I-beam bridges on concrete piles, Route 134, Sect. 102-B—200 ft. steel superstructure, Route 124, Sect. 102-C, all Dist. 6, Sangamon Co.—five 20 ft. spans steel I-beam bridge on creosoted piles and 50 ft. rein.-con. girder bridge, Route 146, Sect. 104-B—120 ft. steel superstructure, Route 146, Sect. 104-C, both Dist. 9, Union Co.—repairing and widening seven 15 ft. spans timber bridge, Route 146, Sect. 111-VB, Dist. 9, Johnson Co.—fifteen 43 ft. steel I-beam approach spans on concrete piles, rein.-con. substructure, Route 148, Sect. 120-B—100 ft. steel superstructure, Route 148, Sect. 120-C, Dist. 7, Jefferson Co.—fifty 20 ft. spans steel I-beam bridge on creosoted piles, graveling approaches, Route 150, Sect. 136-B-1, Alexander Co. F. T. Sheets, hy. engr.

Kentucky—See "Streets and Roads."

Maryland—Aug. 11, by State Roads Comn., Baltimore, G. C. Uhl, chn., altering substructure, etc., bridge over Potomac River at Kitzmiller. Contr. G-74-611, Garrett Co.; adv. E. N.-R. Aug. 6.

Md., Baltimore—Aug. 10, by Dpt. P. Wks., Bureau Hys., constructing Pennsylvania R.R. bridges over Warwick Ave. and Garrison Lane. N. L. Smith, hys. engr.; adv. E. N.-R. Aug. 6.

Mass., Amesbury—Aug. 7 by Essex Co., repairing Essex Merrimac Bridge and Powwow Bridges, $25,000. R. E. Evans, c/o County Comrs., Court House, Salem, engrs. Noted Mar. 26.

N. Y., Buffalo—W. Rathman, takes bids in October, lift bridge over Buffalo River, South Michigan Ave., having 17½ ft. vertical clearance and 100 ft. span, 38 ft. roadway and one 5 ft. sidewalk. $500,000. E. P. Lupfer, Ellicott Sq., engr.

Okla., Purcell—Aug. 11, by State Hy. Dpt., Oklahoma City, 2 span 220 ft. steel truss bridge on pile piers, McClain Co., here. $65,000. A. R. Losh, hy. engr.

CONTRACTS AWARDED

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, repairing bridge over Petaluma Creek at Green Point, incl. repairs, replacing floor, replacements, additions to operating equipment, Marin and Sonoma Counties, and steel bridge over Fresno River at Maderia, incl. ten 41 ft. spans, two 40 ft. spans steel stringer bridge on steel pile bents, Maderia Co., to Gutlenben Bros., Oakland, $19,829 and $37,791 respectively. Noted July 2.

Calif., Los Angeles—Widening six 30 ft. spans rein.-con. bridge over Santa Anita Wash at Huntington Dr., from 26 to 70 ft. wide, 5 ft. sidewalks, to Johnson Constr. Co., 2131 Barclay St., $37,000. Noted Apr. 16.

Calif., San Rafael—R. E. Graham, clk. Marin Co., 3 rein.-con. bridges 1 each at Berri, Cambinini and Margetti ranches, to O. H. Smith Freitas Bldg., $16,765; rein.-con. bridge at Bressioni Ranch, to G. Owens, 212 Wilson St., Pataluma, $1,512. Noted June 4.

Kentucky—State Hy. Dpt., Frankfort, constructing trestle approach and reconstructing steel span bridge over Clarks River near Murray, Calloway Co., to R. F. Pryor & Co., Mayfield, $25,607. Noted July 9 under "Streets and Roads."

Maine—State Hy. Comn., Augusta, constructing 1,080 ft. long, 17 span, concrete and steel bridge, 2 abutments and 16 piers, at Bucksport to New England Contractors Supply Co., 40 Bell St., New London, Conn., $151,554, est. $300,000. Noted July 2.

Mass., Great Barrington—Town, concrete and steel bridge over Williams River to Sermini & Giracca, Housatonic. Est. $25,000.

Minn., Rochester—State, c/o State Hy. Dpt., 1246 University Ave., St. Paul, Bridge 5012, five 40 ft. spans to Feller Bros., Rochester $20,674, Bridge 5013, three 35 ft. spans, State Project 7-43, to L. M. Feller, Rochester, $10,942.

Mo., Independence—Bd. Comrs. Jackson Co., 154 ft. 4 in. bridge on Buckner Fornsney Rd. to B. D. Prater, Harrisonville, $16,483; 6 rein.-con. bridges on Colborn Rd. to J. W. McMurray Co., Railway Exch. Bldg., Kansas City, $99,406.

Mo., Keysterville—Bd. Comrs. Charlton Co., bridges and culverts, to Pan-American Bridge Co., Moberly, $30,175.

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Bridges (Continued)

New Jersey—State Hy. Comn., Trenton, 2 bridges on Route 2, Sect. 6, Essex and Passaic Sts., Maywood and Rochelle Park Boros, Bergen Co., to Anderson Constr. Co., West New Brighton, N. Y., $94,286. Noted July 16.

N. J., Oak Ridge — Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, bridge over tracks on Route 23, to H. B. Davenport Eng. & Constr. Co., Pompton Lakes, $26,907.

N. J., Rahway—Bd. Freeholders Union Co., Court House, abutment wing walls, widening bridge over South Branch Rahway River, to Dan Carro & Co., 816 South St., Elizabeth. Est. $25,000.

New York and **New Jersey**—Port of New York Authority, 80-90 8th Ave., New York, toll buildings and flood lights towers in Ft. Lee, N. J., for George Washington Bridge over Hudson River, to DeRisco Constr. Co., 551 5th Ave., New York, $129,344; paving, to J. E. Donovan, 2207 Richmond Terrace, Port Richmond, N. Y., $63,681. Noted June 25.

New York—State Hy. Dpt., Albany, bridges in St. Lawrence Co., to Scott Bros. Constr. Co., Inc., 233 West Dominick St., Rome, $44,406 est. $59,435—Orleans Co., to Ryan Quarries, Inc., Albion, $14,455 est. $19,542—Monroe Co., to Parsy Lunna Co., Larchmont, $9,488 est. $13,027—Chenango Co., to M. R. Ingraham, Inc., 444 Bway., Albany, $56,447 est. $78,941—Orange Co., to E. L. North, Wantaugh, $16,769 est. $22,385—Grand total $141,565. Noted June 18 and 25, under "Streets and Roads."

O., Cincinnati—Comrs. Hamilton Co., 1 span, 80 ft. concrete arch bridge, McKelvey Rd., to Ohio Valley Constr. Co., Chamber of Commerce, $22,138 est. $29,481. Noted June 25.

Pennsylvania—State Hy. Dpt., Harrisburg, 2 span rein.-con. bridge 30 ft. roadway, Route 49, Junita Twp., Bedford Co., to Welsh Constr. Co., 2331 Los Angeles Ave., Pittsburgh, $27,955. Noted July 2 under "Streets and Roads."

Pennsylvania—State Hy. Dpt., Harrisburg, 70 ft. single through plate girder bridge, 30 ft. roadway, 5 ft. sidewalk, also 1,443 lin.ft. 8 in. concrete roadway on approaches, Route 60, Pine Creek Twp., Jefferson Co., to Pittsburgh Drainage Engineers, 438 South Dallas Ave., Pittsburgh, $30,753. Noted June 18, under "Streets and Roads."

Pennsylvania — State Hy. Dpt., Harrisburg, fabricating, erecting 113½ ft. single span through plate girder bridge with approaches, 32 ft. roadway, concrete abutments, incl. 274,500 lb. fabricated steel, 137,100 lb. plain steel bars, Jenkins Twp., Luzerne Co., to C. and D. Constr. Co., Altoona, 54,835—77½ ft. through plate girder bridge, approaches, 30 ft. roadway, Greenwood Twp., Columbia Co., to L. L. Keister, Lewisburg, $15,340 — 45 ft. rein.-con. beam bridge, 30 ft. roadway, Cummings Twp., Lycoming Co., to H. Budd, Jersey Shore, $10,196. Grand total $80,371. Noted July 2 under "Streets and Roads."

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., superstructure for 4 span 1,575 ft. steel bridge, 275 ft. channel span, South 10th St., to American Bridge Co., Frick Bldg., $713,422. Est., $790,000. Noted July 9.

Vt., Ludlow—Town, Bd. Selectmen, 1 span, concrete bridge and abutments, over Black River to T. J. Harvey, East Hoosac St., Adams, Mass. Est. $25,000.

Wisconsin—State Hy. Comn. and Vernon Co. Hy. Committee, Lacrosse, constructing Readstown Bridge, S.T.H.11, Federal Aid Project 422-B, Vernon Co., to Repaid & Fulton Co., Superior, $50,123. Noted July 9.

Ont., Hamilton—A. Kent, city clk., superstructure 400 ft. long, 70 ft. wide, steel and concrete, new high level bridge, York St., to Hamilton Bridge Co., Bay St., N., $178,000; substructure to E. P. Muntz, Ltd., 1104 Temple Bldg., Toronto, $124,980. Noted May 14.

STREETS AND ROADS

BIDS ASKED

Ark., Rogers—See "Contracts Awarded."

Calif., Los Angeles—See "Contracts Awarded."

Calif., Los Angeles—Bd. Supervs. Los Angeles Co. taking bids improving Covina Blvd., incl. 20,000 cu.yd. excav., 370,000 sq.ft. 9-7-9 in. concrete pavement, 185,000 sq.ft. oil and sand finish 117 tons asphaltic concrete surface, 97 tons asphaltic concrete base.

Calif., Los Angeles—Aug. 12, by Bd. P. Wks., City Hall, grading, curbing, guttering, sidewalks, 6 in. concrete paving 240,000 sq.ft. 112th St. and Bellhaven Street Improvement Dist. Former bids rejected. Noted Apr. 23.

Calif., Los Angeles—Aug. 17, by Bd. Supervs. Los Angeles Co., grading 8 x 6 x 6 x 8 in. concrete paving 198,000 sq.ft. Normandie Ave., between Manchester and Imperial Hy.

Calif., Menlo Park—Aug. 11 by City Council, grading, curbing, sidewalks, 2 in. emulsified asphalt on 4 in. waterbound rock surfacing Arbor Rd., et al. $50,000.

Calif., Sierra Madre — Aug. 12, by City Council, curbing, sidewalks, storm drains, 3 in. asphaltic concrete paving 125,000 sq.ft. Woodland Dr., et al.

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Georgia—Aug. 14, by J. W. Barnett, East Point, engr., sand asphalt surfacing 0.7 mi. Cario-Bainbridge Rd., Federal Aid Project 325-D, Decatur Co.; asphalt paving 14.71 mi. Coastal Hy., State Aid Project 177, Bryan and Liberty Counties.

Illinois—Aug. 18, by State Dept. P. Wks & Buildings, Div. Hys., Springfield, concrete bituminous filled brick on concrete or bituminous concrete (fine or coarse aggregated type) on concrete surfacing 0.77 mi. Route 18, Sect. 7R-1, 40 ft.—2.69 mi. Route 19, Sect. 86-Y, 10 and 16 ft.—2.92 mi. Route 19, Sect. 88-1Y, 10 and 40 ft. 1 mi. Route 46, Sect. 464-MY, 10 and 40 ft.—6.49 mi. Route 52, Sect. 524, 20 and 40 ft., 5.37 mi. Route 58, Sect. 684-Y, 10 and 40 ft.—3.02 mi. Route 60, Sect. 120-Y, 11 and 40 ft., 0.28 mi. Route 63, Sect. 631X-1, 40 ft., all Dist. 1, Cook Co.—1.47 mi. Route 42, Sect. 113-F, 30 ft., Dist. 1, Lake Co.—6.62 mi. Route 47, Sect. 106, 20 ft., Dist. 1, Kane Co.—8.178 mi. Route 48, Dist. 1, Sect. 135—7.05 mi. Route 48, Sect. 136, both Dist. 6, Christian Co.—7.35 mi. Route 48, Sect. 137, 20 ft., Dist. 6, Christian and Montgomery Counties—10.84 mi. Route 71, Sect. 115, 18 ft., Dist. 2, Lee and De Kalb Counties—5.97 mi. Route 99, Sect. 105, 18 ft., Dist. 4, McDonough Co.—3.71 mi. Route 104, Sect. 141, 18 ft., Dist. 6, Sangamon Co.—2.31 mi. Route 104, Sect. 143-X, 18 ft., Dist. 6, Christian Co.—5.38 mi. Route 120, Sect. 115, 18 ft., Dist. 5, Piatt Co.—2.51 mi. Route 127, Sect. 103, 18 ft., Dist. 8, Montgomery Co.—4.95 mi. Route 130-A, Sect. 101, 18 ft., Dist. 7, Jasper Co.—3.44 mi. Route 150, Sect. 134—3.42 mi. Route 150, Sect. 135, both 18 ft., Dist. 9, Alexander Co.—2.7 mi. Route 178, Sect. 106, 18 ft., Dist. 3, La Salle Co.—grading, drainage structures, 0.32 mi. Route 18, Sect. 8-VA., Dist. 1, Cook Co.—3.58 mi. Route 89, Sect. 105-A, Dist. 3, Marshall Co.—3.6 mi. Route 100, Sect. 123-A, Dist. 8, Pike Co.—6.91 mi. Route 100, Sect. 124-A, Dist. 8, Calhoun Co.—2.43 mi. Route 124, Sect. 101-A—5.19 mi. Route 124, Sect. 102-A, both Dist. 6, Sangamon Co.—5.54 mi. Route 146, Sect. 104-A, Dist. 9, Union Co.—6.76 mi. Route 147, Sect. 116-A, Dist. 9, Johnson and Pulaski Counties—10.66 mi. Route 148, Sect. 120-A, Dist. 7, Jefferson Co.—6.73 mi. Route 150, Sect. 122-A, Dist. 9, Jackson and Randolph Counties. F. T. Sheets, hy. engr.

Illinois—Aug. 25 (extended date), State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete, bituminous filled brick on concrete, or bituminous concrete (fine or coarse graded aggregate type) on concrete paving 0.33 mi. Route 5, Sect. 6-S, Dist. 1, Cook and Du Page Counties—0.77 mi. Route 18, Sect. 7R-1—3.14 mi. Route 19, Sect. 86-Y—2.92 mi. Route 19, Sect. 88-Y—1 mi. Route 46, Sect. 464-M-Y—0.5 mi. Route 49, Sect. 146-X, all Dist. 1, Cook Co.—4.1 mi. Route 53, Sect. 533—0.73 mi. Route 54, Sect. 544-X, both Dist. 1, DuPage Co.—2.4 mi. Route 127, Sect. 103, Dist. 8, Montgomery Co.—3.53 mi. Route 150, Sect. 134—3.38 mi. Route 150, Sect. 135, both Dist. 9, Alexander Co.—grading, drainage structures, 0.36 mi. Route 18, Sect. 8-V-A, Dist. 1, Cook Co.—7.86 mi. Route 104, Sect. 121-A, Dist. 6, Brown Co.—7.95 mi. Route 104, Sect. 122-A, Dist. 6, Brown and Pike Counties—3.02 mi. Route 143, Sect. 105-A, Dist. 9, Saline Co.—10.66 mi. Route 148, Sect. 120-A, Dist. 7, Jefferson Co.—2.32 mi. Route 150, Sect. 133-A, Dist. 9, Alexander Co. F. T. Sheets, ch. engr. Noted July 9.

Ind., Crown Point—Aug. 17, by Bd. Comrs. Lake Co., concrete surfacing N. G. Austin Rd., St. John Twp., $90,000. W. E. Whitaker, Crown Point, aud.

Ind., Laporte—Aug. 15, by Bd. Comrs. Laporte Co. concrete surfacing Lewis Harness Rd. $110,032. R. W. Leets, Laporte, aud.

Ind., Plymouth—Aug. 10, by Bd. Comrs. Marshall Co., concrete surfacing A. R. Clizbe Rd. $15,213—gravel surfacing Bennie Gardner Rd. $9,368—Granville Horn Rd. $5,023. O. H. Weber, Plymouth, co. aud.

Ia., Ames—City Council, bids in Sept. curbing, concrete paving 2nd St. from Grand Ave. to Riverside Dr., South Russell Ave. from Lincoln Way to South 3rd St. and 6th St. from Northwestern Ave. to Chicago & Northwestern Viaduct.

Kentucky—Aug. 12, by State Hy. Dpt., Frankfort (F.A.P. means Federal Aid Project, S.A.P. means State Aid Project), grading, drainage structures, 1.78 mi. Columbia-Albany Rd., S.A.P. 255-AG, Adair Co.—4.267 mi. Liberty-Lebanon Rd., S.A.P. 62-BG, Casey Co.—3.683 mi. Shelbyville-LaGrange Rd., S.A.P. 59½-CG, Shelby Co.—3.378 mi. Henderson-Dixon Rd. F.A.P. 34-CE-G2, Webster Co.—grading, drainage structures, surfacing 2.102 mi. Scottsville-Bowling Green Rd., F.A.P. 228-B-GS, Allen Co. drainage structures Morganfield-Uniontown Rd., S.A.P., 122-AB, Union Co.—surfacing 9.909 mi. Calhoun-Beech Grove Rd., S.A.P., 2½-DS, McLean Co.—5.718 mi. Beech Grove-Eastwood Ferry Rd., S.A.P., 2½, C. S. McLean Co.—11.603 mi. Sturgis-Shawneetown Rd., S.A.P., 121-GS, Union Co.—bridges and approaches on Carrollton-War-

La., Lafayette — City Council rejected bids July 7, widening concrete paving Buchanan, 3rd and Simcoe Sts., full width concrete paving West Grant Ave., Vine, Cypress and Chestnut Sts. L. J. Voorhies, City Hall, engr.

La., St. Francisville—Aug. 11, by Mayor, asphalt paving 3 streets.

Maryland—Aug. 11 by State Roads Comn., Baltimore, G. C. Uhl, chn., gravel surfacing 1.03 mi. Contr. AA-124-84, Anne Arundel Co.; sheet asphalt paving 1 mi. Contr. BC-108-74 Baltimore City—concrete paving 1.84 mi. Contr. H-130-42, Harford Co.—concrete shoulders 6.95 mi. Contr. 171-311, Montgomery Co.; adv. E.N.-R. Aug. 6.

Maryland—Aug. 18 by State Roads Comn., G. C. Uhl, chn., grading, drainage structures, substructure for bridge over C. and O. Canal 6.08 mi. hy. along the Oldtown-Paw Paw Rd. Contr. A-95-62 Allegany Co.; adv. E.N.-R. Aug. 6.

Massachusetts—Dpt. P. Wks., A. W. Dean, engr., State House, Boston, received no bids July 28, bituminous macadam paving 2,100 ft. hy. Saugus. Will readvertise. Noted July 22 Daily.

Massachusetts—Aug. 11, by Dpt. P. Wks., A. W. Dean, engr., gravel and bituminous macadam paving incl. rein.-con. beam bridge over Ipswich River, 250 ft. Topsfield—gravel and bituminous macadam paving 5,350 ft. hy. Holbrook—bituminous macadam paving 16,968 ft. Egremont—7,000 ft. Rockland.

Massachusetts—Aug. 13 by Metropolitan Dist. Comn., 20 Somerset St., Boston, constructing Nonantum Road extension from Hyde Brook, Newton, to Water St., Watertown; 6,101 lin.ft. granite block edging, 2,880 sq.yd. cement concrete walks, sheet asphalt or warrenite bitulithic resurfacing 15,500 sq.yd. Memorial Dr., Cambridge. E. H. Rogers, c/o Metropolitan Dist. Comn., 20 Somerset St., Boston, dir.

Massachusetts — Aug. 14, by Metropolitan Dist. Water Supply Comn. 20 Somerset St., Boston, grading, stone walls, etc. in connection with Wachusett-Coldbrook Tunnel, Contr. 1, Barre and Contr. 2, West Boylston.

Mass., Boston—Aug. 12, by Dpt. P. Wks., sheet asphalt or bitulithic paving, sewerage works in Charles St., etc., Wards 3 and 5. $100,000. J. A. Rourke, Dpt. P. Wks., comr.

Michigan—Aug. 12, by W. J. Kingscott, division engr., McNair Bldg., Kalamazoo, grading, shaping, concrete paving 18,202 sq.yd. FO11-9C-3, C-4 and C-5, Berrien Co.

Minneapolis—Aug. 18, by State Hy. Dpt., St. Paul, grading, etc. 9.5 mi. State Project 5-42. 5.8 mi. S. P. 7-27, 23.1 mi. S. P. 9-24, 12.4 mi. S. P. 12-32, 7 mi. S. P. 6-51, 12.1 mi. S. P. 16-27, 14.3 mi. S. P. 16-29, 7.2 mi. S. P. 28-32.

Mo., Independence—City Council, bids August grading 2.25 mi. Nolan St. 40 ft. asphaltic concrete resurfacing 1.5 mi. Pleasant St. R. H. Jones, City Hall, engr.

New Hampshire—Aug. 13, by State Hy. Dpt., Concord, 6 in. one course rein.-con. on 8 in. gravel base course surfacing 30,357 sq.yd. Daniel Webster Hy., Pembroke-Allentown and Hooksett. $160,000.

N. J., Cliffside Park—Aug. 10, by Bd. Boro Hall, grading, curbing, sidewalks, sheet asphalt on concrete paving DeSota and Shannon Pls. $25,000. McClave & McClave, 600 Gorge Rd., boro. engrs.

New York—Aug. 21, by State Dpt. P. Wks., Div. Hys., Albany, improving 0.76 mi. road, Washington Co. A. W. Brand, comr.; adv. E.N.-R. Aug. 6.

N. Y., New York—Aug. 13, by S. Levy, pres. Manhattan Boro. Municipal Bldg., curbing, Thames, Thompson, Sheriff, Sullivan, West 6th, 44th, 95th Sts.

N. Y., St. George—Aug. 12, by J. A. Lynch, pres. Richmond Boro, Boro Hall, bituminous concrete paving Hillside Terrace and grading Bedell Ave.

N. Y., St. George—J. A. Lynch, pres., Richmond Boro, Boro Hall, rejected bids, bituminous concrete paving Simonson Ave. and repairing Van Pelt Ave. Noted May 21.

Ohio—Aug. 21, by O. W. Merrell, dir. hys., Columbus, grading drainage structures, concrete, brick, bituminous macadam or sheet asphalt paving 9.673 mi. Pike, Ross, Hamilton, Jefferson, Knox and Tuscarawas counties, est. $150,-984; resurfacing 129.37 mi. roads in Geauga, Gurnsey, Henry, Lorain, Columbiana, Portage, Stark, Auglaize, Belmont, Harrison, Tuscarawas Carroll; Perry, Coshocton, Fulton, Williams, and Wyandot counties, est. $170,261.

O., Shaker Heights—Aug. 13 by City, vitr. brick, sheet asphalt or concrete paving Scottsdale Blvd. and Nichols Rd. $25,000. F. A. Pease Engr. Co. Terminal Tower, Cleveland, engr.

O., Steubenville—Aug. 14, by Jefferson Co. Comn., concrete paving Wilson Ave. from city limits to intersection of Hill Schoolhouse, $42,-264. E. Martin, Steubenville, engr.

Pa., Phila.—Aug. 18, by Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., Schedule A, grading Edmund St. from Benner to Comly Sts.—Walker St. from Devereaux to Robbins Sts.—Fillmore St. from Tackawanna to Jackson Sts.—Schedule B, asphalt repaving 18th St.—Schedule C, curbing, footway work 1st, 2nd, 3rd, 4th, 5th, 6th and 7th Hy. Dists., intersection Church Lane, Limekiln Pike, 17th St., Lincoln Dr., Emlen and Ellet Sts.

Rhode Island — Aug. 12, by State Bd. P. Roads, Providence, 3 in. bituminous concrete on 6 in. concrete surfacing Newport Ave., 25,000 sq.yd. from Brook St. to railroad bridge approach, Pawtucket, Contr. 3111; adv. E. N.-R. Aug. 6.

Tenn., Alcoa—See "Contracts Awarded."

Tex., Freeport—Aug. 11, by City, I. Goldberg, mayor, E. C. King, secy., curbing storm sewers and necessary appurtenances, one course rein.-con. paving, 38,000 sq.yd. F. J. Von Zuben, 802 Fair Bldg., Fort Worth, supervy. engr. Noted July 2.

Tex., Marshall—Aug. 18 by City, c/o H. J. Graeser, mgr., concrete curbing, guttering 21,940 lin.ft., laying 7,448 lin.ft. storm sewer pipe, permanent paving 48,220 sq.yd. $140,000. W. C. Albright, Marshall, engr. Noted June 11.

Streets and Roads (Continued)

Tex., Memphis—Aug. 10, by Comrs. Court Hall Co., c/o A. C. Hoffman, judge, grading, concrete paving 112,838 sq.yd. on finished graded county road. Hasie Engrg. Co. Inc., Memphis, engr.

Washington—Aug. 18, by S. J. Humes, dir. Hys., Olympia, grading, crushed stone surfacing 8.4 mi. State Rd. 2, Creston to Wilbur, Lincoln Co.—3.9 mi. State Rd. 3, Wallula East, Walla Walla Co.—clearing, grading 0.2 mi. State Rd. 1, 26th and East D Sts. to 25th and East G Sts., Tacoma, Pierce Co.—2 bridges on State Rd. 3, between Roza and Yakima, over Yakima and Naches rivers, Yakima Co.—2 concrete bridges, 2 concrete box culverts on State Rd. between Ellensburg and Roza, Kittitas Co.

Wash., Kelso—Comrs. Cowlitz Co. takes bids about Aug. 28, constructing 5.1 mi. Lateral Hy. 3 to West Kelso. $55,000. F. C. Cramer, Kelso, engr.

CONTRACTS AWARDED

Ark., Rogers—Bd. Comrs. Benton Co., constructing 12 mi. road between Rogers and Cave Springs, own forces.

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, grading, untreated crushed gravel or stone surfacing 2.9 mi. road between West boundary and Toll House, Nevada Co., to Hemstreet & Bell, Marysville, $90,762. Noted June 26.

California — C. H. Purcell, engr. State Hy. Comn., Sacramento, bituminous treated crushed gravel or stone (road mix) surfacing 8.6 mi. road between Riverton and Kyburz, El Dorado Co., to Tiffany, McReynolds & Tiffany, 821 South 1st St., San Jose, $33,793—bituminous treated material surfacing 5.2 mi. road between Mays and Nevada State Line and 1.8 mi. road between Bay View and Eagle Rock, El Dorado Co., to Force Constr. Co., Piedmont, $37,051—grading, concrete and asphaltic concrete surfacing 1.4 mi. road between Coyote Creek and San Jose, Santa Clara Co., to Union Paving Co., Call Bldg., San Francisco, $62,426—grading 7.4 mi. road between Orange Hill and Pain Flat, Mariposa Co., to Frederickson & Watson and Frederickson Bros., 354 Hobart St., Oakland, $91,312. Grand total $224,582. Noted June 25.

Calif., Berkeley — Regents of University of California, curbing sidewalks, widening, paving Allston Way, et al., to Oakland Paving Co., 5000 Bway., Oakland, $21,175. Noted July 9.

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., improving 4 mi. Hy. in Santa Anita Canyon, day labor. Est. $130,000. H. A. Thatcher, supervisor.

Calif., Monticello—J. P. Walker, city clk., curbing, guttering, sidewalks, vitr. sewers, asphaltic concrete on 3½ in. asphaltic concrete with disintegrated sub-base paving 6th St. between Washington Ave. and Beverly Blvd., to Griffith Co., Railway Exch. Bldg., Los Angeles, $25,890. Noted June 4.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, curbing, sidewalks, 1½ in. asphalt, 1¼ in. binder on Class E base paving 230,000 sq.ft. Sect. C. Alamany Blvd., to Hanrahan Co., Hobart Bldg., $75,599. Noted July 2.

Calif., San Diego—City Council, concrete curbing, 3 small culverts, concrete sidewalks, grading, 6 in. asphaltic concrete surfacing 7,784 sq.yd., 2 in. asphaltic concrete resurfacing 2,571 sq.yd. Torrey Rd., to V. R. Dennis Constr. Co., 3911 5th St., $18,534.

Calif., Yreka—U. F. Brown, city clk., grading, concrete paving 130,000 sq.ft. Center St., et al., to N. M. Ball, 1889 Yosemite Rd., Berkeley, $32,460. Noted Apr. 23.

Connecticut—J. A. MacDonald, state hy., comr., Hartford, to Oneglia & Gervasini, South Main St., Torrington, trap rock waterbound macadam paving hy. in Plainville, $29,973; 22,350 ft. Avon, $40,162; waterbound macadam paving 5,150 ft. hy., Plymouth, $30,412—to Arborio Road Constr. Co., 525 Main St., Hartford, trap rock waterbound macadam paving 4,519 ft. Essex, $27,073—to Edgewood Concrete Co., Whalley Ave., New Haven, waterbound macadam paving 7,938 ft. North Branford, $36,353—to Edward Balf Co., 16 Haynes St., Hartford, 6,900 ft. Simsbury, $20,026—to N. Benvenuti & Son, 6 Elm St., New London, 11,500 ft. Waterford, $49,249—to Holbrook Co., Westbrook, 4,000 ft. Westbrook, $23,887—to I. Savin, 408 Main St., Hartford, gravel surfacing 7,200 ft. Anover, $6,168 and Coventry $10,899—to Altieri & Petruccione, 591 Congress Ave., Waterbury, 4,030 ft. Chester, $7,750—to Lane Constr. Co., 37 Colony St., Meriden, bituminous macadam paving 4,234 ft. East Windsor $8,118—to C. W. Blakesley & Sons, 58 Waverly St., New Haven, 4,342 ft. New Haven, 14,102—to A. Brazos & Sons, Main St., Middletown, gravel surfacing 14,100 ft. Lyme $9,636—to F. D. Miller Co., 43 Broadway, Norwich, 10,300 ft. Old Lyme, $10,982. Grand total $324,790.

Connecticut—J. A. Macdonald, Hartford, hy. comr., graveling 5,213 ft. hy. Woodstock, to Thompson Constr. Co., Main St., Thompson—32,100 ft. Killingworth to F. Brooks, Higganum, 21,700 ft. Roxbury, to Litchfield County Building Co., Bridgewater—gravel surfacing hy. in Cromwell to C. W. Blakeslee & Sons, 58 Waverly St., New Haven. Est. exceeds $25,000.

Idaho — A. Harbour, comr. P. Wks., Boise, grading, surfacing 2.757 mi. Payette Hy., Valley Co., to Triangle Constr. Co., 1220 Ide St., Spokane, Wash., $25,759—1.991 mi. Lost River Hy., Bingham Co., to J. W. Peterson, Gooding, $20,554—7.062 mi. Elk City Hy., Idaho Co., to Ora Bundy, Ogden, $92,224. Grand total $138,537. Noted July 16.

Ind., Anderson—Bd. Comrs. Anderson Co., improving Charles H. Smith Rd. in Alexandria, to Anglemeyers Bros., Elwood, $15,441, est. $18,159; W. H. Stevens Rd., to J. T. Burke, Anderson, $11,590, est. $12,073. Noted Apr. 9.

Ind., Boonville—City Council, rock asphalt paving 9 blocks Walnut St. and 12 blocks Sycamore St., to Sweet & Wright, Greencastle, at $1.06 per sq.yd. Est. $35,000.

Ind., Hartford City—City Council, repaving, repairing streets, to Andrews Paving Co., Hamilton, O. Est. $25,000.

Ind., New Albany—City Council, asphalt paving State St., to Southern Paving Co., New Albany. Est. $26,000.

Ind., Washington—City Council, to F. Cosby, Washington, improving East Flora St. at $1.37 per yd., West Poplar St., $1.83 per yd. Est. $26,000.

Ia., Riverside—H. E. Doud, town clerk, curbing, guttering, paving 7,000 sq.yd. to Horrabin Contg. Co., Iowa City, $12,144. Noted July 9.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures, using 1st class rein.-con. pipe, 5.981 mi. Bowling Green-Honaker Rd., Warren Co., to L. B. Cundiff, Somerset, $35,432. Noted July 9.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures 6.7 mi. road in Casey Co., to Phelps Constr. Co., Somerset, $69,104—6.9 mi. Knott Co., to Hart Constr. Co., Whitesburg, $81,149—6.1 mi. Monroe Co., to J. A. Sutherland Co., 166 8th Ave. N., Nashville, Tenn., $42,873—traffic bound macadam surfacing 7.2 mi. Hardin Co., to Merry & Cisler, Laldwell, O., $84,993—11.6 mi. Washington Co., to Gay-Coleman Constr. Co., Ashland, $50,407—surfacing Fields Hy. through Flemingsburg, Fleming Co., to Irvine Constr. Co., Irvine, $23,228. Grand total $351,754. Noted June 18.

Maine—State Hy. Dpt., Augusta, gravel surfacing 5.86 mi. hy. Topsfield and 4.11 mi. Farmington to C. E. Horne, Millbury, Mass., $92,859 and $53,949 respectively—0.85 mi. Verona to Litchfield & Douglas, Brunswick, $14,772—1.47 mi. Canaan to Cianchette & Co., Pittsfield, $22,737—bituminous macadam paving 2.39 mi. Oxford, to W. H. Hinman, Inc., Skowhegan, $80,710—concrete surfacing 3.56 mi. Gorham, to A. Susi & Co., Roslindale, Mass., $67,721. Grand total $332,748.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bitulithic paving 400 ft. hy. incl. rein.-con. beam bridge over Williams River, West Stockbridge, to Sermini & Giracca, Oak St., Housatonic, $14,430 — bituminous macadam paving 7,895 ft. Stockbridge and 5,103 ft. Hadley, to Lane Constr. Corp., 37 Colony St., Meriden, Conn., $45,226 and $22,087 respectively—4,700 ft. Nantucket to M. F. Roach & Sons, East Bridgewater, $18,376. Grand total $100,119. Noted July 16.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving Washington St., Ward 3, to John McCourt Co., 910 Huntington Ave. Est. $25,000. Noted July 16.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., artificial stone sidewalks, in Wards 4, 5, 6 and 7, to J. A. Singarella, Park Sq. Bldg. Est. $25,000.

Mass., Cambridge—W. R. McMenimen, supt. streets, City Hall, bituminous penetration paving Prison Point St., to Simpson Bros. Corp. 77 Summer St., Boston, at $5.00 per sq.yd., est. $25,000. Former contract rescinded. Noted July 9.

Mass., Edgartown—Town, Bd. Selectmen, rebuilding and sheet asphalt repaving Winter, School Sts., etc., to M. F. Roach Constr. Co., Taunton. Est. $25,000.

Mass., Lawrence—City, Street Dpt., City Hall, J. W. McCarthy, vulcanized sheet asphalt paving streets to Simpson Bros. Corp., 77 Summer St., Boston, at $1.97 per sq.yd. $25,000 or more.

Mass., Malden (br. Boston) — Dpt. P. Wks., sheet asphalt warrenite bitulithic paving Pleasant, Exchange and Lebanon Sts. and Eastern Ave., to Warren Bros. Roads Co., 38 Charles River Rd. Cambridge. Est. exceeds $25,000. Noted July 2, under "Contracts Awarded."

Mass., Westwood—Town, Bd. Selectmen, sheet asphalt paving Pond and Stearn Sts., to J. R. Lafola Constr. Co., Dedham, $22,000. Est. $25,000.

Mass., Woburn — Dpt. P. Wks., vulcanized sheet asphalt paving Main St., to Simpson Bros. Corp., 77 Summer St., Boston. Est. $25,000.

Michigan—A. L. Burridge, division engr., Cadillac, grading, shaping, concrete paving, 10.786 mi. FO6-12C-2, Arenac Co., to C. G. Bridges, Escanaba, for State Hy Comn., Lansing, $210,124.

Michigan—H. W. Hagaman, division engr., 208 Kresge Bldg., Port Huron, grading, drainage structures, concrete paving 5.434 mi. FO79-36C-1, Tuscola Co., to Hersey Gravel Co., Hersey, $150,434. Noted June 25.

Michigan—W. J. Kingscott, division engr., 213 Watson Bldg., Grand Rapids, grading, drainage structures, concrete paving 0.431 mi. MO70-33C-1, Ottawa Co., to H. A. Hoxie, St. Joseph, for State Hy. Comn., Lansing, $22,616. Noted June 25.

Michigan—H. G. Oakes, division engr., Plymouth, grading, drainage structures, concrete paving, 5.46 mi. FO82-8C-3, and 0.89 mi. FO82-7C-2, Wayne Co., to Wayne County Road Comn., Detroit, for State Hy. Comn., Lansing, $236,123 and $27,322, respectively.

Minnesota—State Hy. Dpt., St. Paul, grading 16 mi. State Project 4-49, Sects. 2 and 3, to W. N. Petrie, Champlin, $68,041; 3.8 mi. S. P. 59-26 and S. P. 9-30, Sect. 4, to Charles Weaver, Anoka, $71,985. Noted July 9.

Mississippi—State Hy. Comn., Tower Bldg., Jackson, grading, paving 20,682 sq.yd. Jackson-Meridian Rd., Federal Aid Project 185-B reopened Lauderdale Co., to Cobb Bros. Constr. Co., Meridian, $32,064. Noted July 16.

Miss., Yazoo City—City Council, curbing, guttering, grading, concrete paving 34,398 sq.yd. to Wright Constr. Co., Yazoo City. $135,000. Noted June 4.

Mo., Kansas City — City Council, 2 in. asphaltic concrete on 8 in. concrete paving south approaches to Kansas City Terminal tracks at Brooklyn Ave., to Boyle Constr. Co., 226 West 39th St., $80,502.

Nebraska—State Hy. Dpt., Lincoln, grading 10 mi. O'Neil-Bartlett Rd. Wheeler Co., to Yant Constr. Co., 1146 Omaha Natl. Bank Bldg., Omaha, $39,405—8 mi. same road, Holt Co., to F. L. Busche, 4118 North 30th St., Omaha, $34,976—14 mi. McCook South Rd., Red Willow Co., and 11.5 mi. Sterling-Tecumseh Rd., Johnson Co., to G. W. Condon Co., 223 Grain Exch. Bldg., Omaha, $35,515 and $41,736 Respectively, oiled sand surfacing 10.8 mi. O'Neil-Bartlett Rd., Wheeler Co., to Central Bridge & Constr. Co., Wahoo, $41,761. Grand total $193,393.

Nevada—Directors Dpt. Hys., Heroes Memorial Bldg., Carson City, oil processing roadbed by road mix method on 8.61 mi. State Hy. Lyon Co., to Dodge Bros., Inc., Fallon, $27,237—10.13 mi. State Hy. Churchill Co., to Jack Casson, Hayward, Calif., $24,151.

New Jersey—State Hy. Comn., Trenton, 10 in. rein.-con. paving 53,215 sq.yd. Route 6, Sects. 2A, 3A and 1D, Abbott Ave. to Christie's Lane and Grade Avenue Separation, Bergen Co., to G. M. Brewster, Bogota, $205,420; 52,540 sq.yd. 9 in. rein.-con. paving Route 8-28, Sect. 1, Middlesex Co., to Ross & Taylor, 471 Southard St., Trenton, $179,204. Noted July 16.

N. J., Hawthorne—Bd. Boro Comrs., Boro Hall, penetration paving Central and Brookside Aves., to S. Braen & Sons, Nelson St., $14,679. Noted July 16.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Pomonok Asphalt Co., 1246 Grand St., Brooklyn, asphalt paving 83rd Ave., $6,242; grading Jamaica Ave., $48,251—to Highway Impvt. & Repair Co., Furmans Island, Brooklyn, asphalt paving Fresh Pond Rd., $20,836—to W. P. McDonald Constr. Co., 7 Lawrence St., Flushing, 40th St., $9,356; 52nd St., $18,860; 41st St., $32,179; Loubest St., $28,706—to Meehan Paving Co., 90 West St., New York, Rosedale Ave., $28,334; 107th Ave., $11,131; 129th St., $12,863; 42nd St., $7,608—to Borough Asphalt Paving Co., 1301 Metropolitan Ave., Brooklyn, Lefferts Blvd., $35,980—to Gramaglia Eng. Co., 5037 Fieldstone Rd., grading 60th St., $4,344—to Peace Bros., Inc., 57 North Lawrence St., Flushing, grading 32nd Ave., $4,950. Grand total, $288,185.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., to Bronx Asphalt Co., Zerega Ave. and Westchester Creek, Bronx, asphalt paving Bronx River Ave., $25,508; Havemeyer St., $19,160; Quimby Ave., $10,156—to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., Bronx, asphalt paving Wilkinson Ave., $3,833; Fieldstone Rd., $5,496; Arthur Ave., $16,232; Manning St., $3,520—to Venetian Contg. Co., East Bay Ave. and Tiffny St., Bronx, Seymour Ave., $7,235—to Columbia Engrg. & Contg. Co. Inc., 61 Bway., granite paving Exterior St., $30,483—to F. Del Balso, 1851 Gerlain St., regulating Middletown Rd., $21,180—to A. Di Angelo, regulating Pelham Parkway S., $26,181. Grand total $169,044. Noted July 9.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., asphalt repaving Columbus Ave. and asphalt paving East 111th St. to Meehan Paving & Constr. Co., 90 West St., $93,352 and $9,636 respectively. Noted July 9.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, resurfacing and paving cinders on Amboy Rd. to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $24,585; and culverts to J. Kelly, Inc., 1150 Forest Ave., Port Richmond, $4,397. Noted July 2.

North Carolina—State Hy. Comn., Raleigh, **P. means Project)**, hydraulic fill on 0.83 mi. P. 2031 Cartaret Co. to Discus Bros., Waynesville, $54,800—widening 1.75 mi. P. 2561, Lemoir Co., to West Constr. Co., Kinston, $36,670—grading, structures and top soiling 4.3 mi. P. 4013 Chatham Co. to Welker Bros., $26,990—5.6 mi. P. 4780 Wake Co. to N. L. Teer, Durham, $31,244—grading 6.7 mi. P. 7330, Davie Co. to G. R. Martin, Salisbury, $28,926; structure on same road to P. Gilmore $32,324—traffic bound macadam paving 5.9 mi. P. 9250 Macon and Clay Counties, to R. G. Lassiter & Co., Raleigh, $31,445—5.95 mi. P. 9694 Madison Co. to M. A. Kollock, Hendersonville, $31,158. Grand total $273,557. Noted July 16.

O., Steubenville—Comrs. Jefferson Co., concrete paving Permar Run Rd., in Steubenville and Cross Creek Twps., 16 ft., to H. M. Bates, Steubenville, $47,956.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, waterbound macadam surfacing 91,551 sq.yd. Route 49, Bedford and Somerset Counties, to Connel & Laub, Nicholson, $185,228. Noted June 19.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage, structures, concrete surfacing 90,697 sq.yd. Route 303, Sect. 1, Columbia and

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Streets and Roads (Continued)

Lycoming Counties to Holmes Constr. Co., Wooster, O., $335,511: 5.729 mi. Route 140, Schuylkill Co., to A. A. White, Inc., Lebanon, $21,109. Noted June 18.

S. D., Huron—City paving Dakato Ave., to Booth & Olson, Insurance Exch., Sioux City, Iowa, $29,731.

Tenn., Alcoa—City Council, c/o V. J. Hultquist, city mgr., curbing, concrete paving 20,000 sq.yd. Own forces. $85,000. R. T. Hale, city engr.

Washington—S. J. Humes, dir. Hys., Olympia, clearing, grubbing, grading, crushed stone surfacing, 7.388 mi. State Rd. 5, Oak Flat to Carmack Bridge, Emergency Federal Aid Project 161-B Yakima Co. to H. G. Johnson, Yakima, $117,484; bituminous cement "E" grade asphalt paving, 30.7 State Rd. 9, end of pavement east of Port Angeles to Discovery Bay in Clallam and Jefferson Counties and 6 mi. State Road 5, Mountain Tea House South, Pierce Co. to J. C. Compton, McMinnville, Ore., $22,160. Noted July 2.

Wash., Port Angeles — Comrs. Clallam Co., bituminous paving 12 mi. Port Angeles-Joyce Rd., to Northwest Road Co., Portland, Ore., $72,894. Noted June 25.

Wash., Walla Walla — City Comrs. paving South Second Ave., et al, to George E. Harding, Walla Walla, $34,788.

Wyoming—State Hy. Comn., Capitol, Cheyenne, surfacing 5.213 mi. Moorcroft-Gillette Rd., Crook Co. and oil treating 20.745 mi. Wheatland-Chugwater Rd., Platte Co. to Northwest Engineering Co., Rapid City, S. D., $16,915 and $12,380 respectively—crushed limerock surfacing 11.504 mi. Guernsey-Dwyer Rd., Platte Co., and surfacing 13.515 mi. Rock Springs-Green River Rd., Sweetwater Co. to T. J. L. Tobin, Casper, $25,810 and $38,740 respectively—23.3 mi. Wind River Rd., Teton Co. to Threet Bros., Lovell, $14,000—oil asphalt surfacing 23.759 mi. Cheyenne-Wheatland Rd., Laramie Co., to R. Spatz, Sheridan, $25,044—regarding 5.011 mi. Lingle-Lusk Rd., Goshen Co. and grading, bridging 4.103 mi. Dwyer West Rd. and 8.664 mi. Wheatland-Orin Rd., Platte Co., to Martin & Norman, Crawford, Neb., $5,320 and $46,395 respectively—oil asphalt surfacing 32.86 mi. Wamsutter-Rock Springs Rd., Sweetwater Co., to A. H. Reed, Cheyenne, $11,533—surfacing 4.098 mi. Evanston West Rd., Uinta Co. to Wheelwright Constr. Co., Ogden, Utah, $8,740—grading, etc., 6.936 mi. Greybull-Lovell Rd., Big Horn Co., to Midwest Constr. Co., Casper, $10,437. Grand total $215,314. Noted July 16.

Ont., Hamilton—City, W. L. McFaul, city engr., asphalt paving Burlington St. from Sherman Ave. to Wilcox St., $12,878; asphalt and brick block paving Burlington St. from Wellington to Wilfred Sts. and Hillyard to Birmingham Sts. $73,140 and $135,626 respectively; concrete sidewalks and curbing, Burlington St., $9,594. Day labor.

Ont., Toronto—City, to Kilmer & Barner, Harbour Bldg., asphalt paving Rountree Ave., $1,835; asphaltic concrete paving Billings Ave., $10,709; concrete paving 1 lane, $845—to Law Constr. Co., 225 Sterling Rd., asphalt paving Millwood Rd., $5,640—to E. Mark, 1903 Davenport Rd., concrete paving 1 lane, $445—to L. P. Acri, 28 Grove Ave., concrete paving 3 lanes, $6,122—to Grant Constr. Co., 47 Wellington St., E., concrete paving 1 lane, $1,201. Grand total $26,697.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Indiana—Bd. Comrs. Madison Co., Anderson, plans re-dredging Peters Ditch, Buck Creek, Madison, Hamilton and Tipton Counties, $50,000. C. Iliff, Summitsville, engr.

Mass., Falmouth—L. I. Hall, Falmouth, plans bulkhead and fill solid, Eel Pond, Woods Hole, $25,000. Private plans.

Va., Hopewell—Atmospheric Nitrogen Co., plans 300 x 920 ft. area 27 ft. depth, construct bulkheads, $100,000. Maturity soon.

Ontario—F. W. Farncombe, engr., Richmond Bldg., London, preparing plans and takes bids about Aug. 15 deepening, widening Whirl Creek Drain in Ellice Twp., $25,000.

BIDS ASKED

Indiana—Aug. 10, by Bd. Comrs. Hendricks and Martinsville Counties at Martinsville, improving 24.978 ft. Robert Bayliss Drain, incl. 24,978 ft. tile, $30,000. H. A. Blunk, Martinsville, engr.

Ind., Anderson — Aug. 22, by Bd. Comrs. Madison Co., dredging Ducks Creek through northern part of county, $70,000. P. Phipps, Anderson, engr.

Ind., Vincennes—Aug. 11, by Bd. Comrs. Knox Co., constructing Wolf-Brocksmith drainage system, incl. main ditch and 15 laterals, $35,000. H. Buckthal, Vincennes, engr.

CONTRACTS AWARDED

Ala., Birmingham—A. J. Hawkins, city engr., Sect. 2, Valley Creek Drainage Project, straightening and widening 6,500 ft. open channel incl. 110,000 cu.yd. dry earth excavation and 37,000 cu.yd. dry rock excavation to Peterson & Simmons, P. O. Box 277, Fairfax, Mo., $73,700. Noted July 2.

Conn., New Haven—City, Supt. Parks, constructing sea wall, Morris Cove, to C. W. Blakeslee & Sons, Inc., 58 Waverly St. $119,415. Noted May 7.

Ind., Decatur—Board Comrs. Adams Co., constructing 60,400 ft. Noah Johnson Drain, to Yost Bros., Decatur. Est. $25,000.

Ind., Shelbyville—Bd. Comrs. Shelby Co., constructing H. P. Gordon Drain, to Burnsides & Hester, Morristown, est. $25,000.

Mass., Boston — City, Dpt. P. Wks., J. A. Rourke, comr., bulkhead, etc., Nashua St. Circle, to Coleman Bros., 245 State St. Est. $25,000.

O., Cleveland—Bd. Comrs., Cuyahoga Co., retaining wall Fairmont Blvd., involving 1,374 cu.yd. mass concrete, 1,815 cu.yd. earth excavation, 101,000 lb. reinforcing steel, to P. H. DeSantis & Co., 12510 Britton Dr., $18,175 est. $27,627. Noted July 9.

Bond Elections

Coming Bond Elections

Waterworks System—Lynneville, Iowa, Aug. 24, E. T. Archer & Co., Kansas City, Mo., engr. $18,000.

Waterworks and Sewers — Valdese, N. C. $150,000.

Sewage Disposal Plant—Bemidji, Minn. Aug. 28. Wolff & Coates, St. Paul, engrs. $35,000.

Court House and Jail—Longview, Tex. Gregg Co. Aug. 18. $200,000.

Bonds Voted

Waterworks Extensions—Cornelia, Ga., $75,000.

Waterworks System—Waynesville, Mo., $21,000.

Waterworks Pipe Line—Smithfield, Utah. E. Schaub, Logan, engr. $50,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., Glendale — FEDERAL BUILDING — Treas. Dpt., at office Superv. Archt., Wash., D. C., plans by Lindsey & Eiden, 609 Union Insurance Bldg., Los Angeles, 210 x 320 ft. steel, concrete, East Bway. between Kenwood and Louise Aves. $455,000.

Conn., Derby—POST OFFICE—Treas. Dpt., at office Superv. Archt., Wash., D. C., plans brick, stone post office unit, West 4th and Olivia Sts. $125,000. Private plans.

Conn., Manchester—POST OFFICE—Treasury Dpt., at office Superv. Archt., Wash., D. C., plans brick, stone post office, East Center and Main Sts. $150,000.

Conn., New Haven — GREEN HOUSE and HEATING PLANT — U. S. Dpt., Agriculture, Marsh Botanical Gardens, rejected bids greenhouse and special steam heating plant.

Ia., Albia—POST OFFICE—Treas. Dpt., at office Superv. Archt., Wash., D. C., preliminary plans concrete, brick, stone post office. $75,000.

Kan., Topeka—POST OFFICE—Treas. Dpt. at office Sup. Archt., sketches rein.-con., brick, stone, U. S. Post Office. $1,065,000.

Me., Portland—POST OFFICE—Treas. Dpt., at office Superv. Archt., Wash., D. C., plans 1 story, basement, brick, stone post office. $115,000.

Mass., Salem—POST OFFICE—Treas. Dpt., at office Superv. Archt., Wash., D. C., plans by Smith & Walker, 80 Boylston St., Boston, post office building, Norman, Margin and Creek Sts. $360,000.

Missouri—PILE DIKES—U. S. Eng., Kansas City, 7,500 ft. pile dikes and 19,000 ft. revetment in Missouri River at Little Missouri and Glasgow Bends.

Neb., Beatrice—POST OFFICE—Treas. Dpt., at office Superv. Archt., Wash., D. C., plans concrete, brick post office. $50,000 available.

Neb., Broken Bow—POST OFFICE—Treas. Dpt., at office Superv. Archt., Wash., D. C., sketches concrete, brick post office. $85,000 available.

Okla., Okmulgee—POST OFFICE—Treas. Dpt., Wash., D. C., plans rein.-con., brick, stone post office. $330,000 available.

Pa., Uniontown—MEMORIAL PARK—U. S. Government, Washington, D. C., and Ft. Necessity Memorial Park, W. B. Hindman, chn., Fayette and Morgan Sts., plans by E. R. Johnson, Fayette T. & T. Bldg., Fort Necessity Memorial Reconstruction on National Hy. 8 mi. east of here, incl. reconstructing farm house into museum, new roadway, stone gateways at entrances, 4 flagpoles, 15 bronze tablets, reconstructing earth and log fort, new bronze monument. $150,000.

Tenn., Johnson City—HOSPITAL—Vet. Bur. Arlington Bldg., plans wing addition to hospital. $450,000.

BIDS ASKED

Ala., Attalla—POST OFFICE—Aug. 14, by Treas. Dpt. at office Super. Archt., U. S. Post office. $70,000.

Ala., Mobile—BOAT BASIN, etc.—Aug. 17 by Treas. Dpt., at office superv. archt., Wash., D. C., boat basin, storage building, at Quarantine Station; adv. E.N.-R. Aug. 6.

Ark., Little Rock—ELEVATOR—Aug. 17, by Treas. Dpt. at office Sup. Archt., elevator in U. S. Post office.

Calif., San Diego—REFRIGERATING PLANT—Spec. 6562—Aug. 18, by Pub. Works Officer 11th Naval Dist., refrigerating plant at Naval Operating Base Air Station.

Calif., San Francisco—WATER MAINS—Aug. 13, by Constr. Q. M., Ft. Mason, San Francisco, extending water mains for non-commissioned officers' quarters at San Francisco Presidio, incl. 1,200 ft. 4 and 6 in. c.i. mains, 4 standard double nozzle hydrants and gate valves.

D. C., Wash.—CABLE, etc.—Aug. 7, by A. L. Flint, genl. purch. agent, Panama Canal, cable, wire, vacuum-cleaner cord, rigid steel conduit; conduit fittings, panelboards, pot heads, outlet boxes, switches, fuses, rivets, pneumatic tires, inner tubes, Schedule 2672.

D. C., Wash.—CLEARING SITE—Aug. 31, by Treas. Dpt. at office Sup. Archt., clearing site and constructing engineer's building for construction of Archives Building. $8,750,000.

D. C., Wash.—FEDERAL WAREHOUSE—Aug. 28 at office Public Bldgs. and Public Parks, Navy Bldg., 7 story, basement, 212 x 252 ft., rein.-con. federal warehouse; adv. E.N.-R. Aug. 6.

D. C., Wash.—GASOLINE—Aug. 11, by A. L. Flint, genl. purch agent, bulk motor-grade gasoline. Schedule 2673.

Fla., Moore Haven—LEVEE, etc.—Sept. 15 at Office U. S. Eng., Jacksonville, 35,000 lin.ft. levee and navigation channel, necessary drainage structures, etc., between Disston Island Drainage Dist. Pumphouse L, near here at Sta. 3/00 and extend toward Clewiston; adv. E.N.-R. Aug. 6.

Ill., Rock Island—SEWERS, etc.—Sept. 1, by U. S. Eng., constructing combination storm and sanitary sewer, underground tile drainage system on Rock Island Arsenal Island; adv. E.N.-R. Aug. 6. Noted July 16.

Ia., Cedar Rapids—POST OFFICE—Aug. 26, Treas. Dpt., at office superv. archt., Wash., D. C., post office; adv. E.N.-R. Aug. 6. Noted July 9.

Ia., Centerville—POST OFFICE—Aug. 28, by Treas. Dpt., at office J. A. Wetmore, superv. archt., Wash., D. C., remodeling and enlarging post office; adv. E.N.-R. Aug. 6.

La., Shreveport—HANGARS, etc.—Aug. 28, at Con. Q.M. Office, Barksdale Field, 4 air corps double hangars, 1 air corps hangar, wing operations building; 1 air corps warehouse and 1 air corps assembly shop at Barksdale Field; adv. E.N.-R. Aug. 6.

La., New Orleans—LEVEES—Aug. 21, by U. S. Eng., 39,000 cu.yd. earthwork in Spoil Bank for Closure of gaps in side levees, Bonnet Carre Spillway.

Mich., Ironwood—POST OFFICE—Aug. 28, by Treas. Dpt., at office superv. archt., Wash., D. C., post office; adv. E.N.-R. Aug. 6.

Mo., Centralia.—POST OFFICE—Aug. 13, by Treas. Dept. at office Sup. Archt., 2 story, rein.-con., brick, stone, U. S. Post office. $70,000. Noted May 7.

N. H., Somersworth—POST OFFICE—Aug. 27, by Treas. Dpt., at office superv. archt., Wash., D. C., post office; adv. E.N.-R. Aug. 6. Noted Dec. 25.

N. Y., New York—EQUIPMENT—Aug. 20, by Treas. Dpt. at office Sup. Archt., mail handling equipment at U. S. Parcel Post office.

N. Y., Potsdam—POST OFFICE—Aug. 21, by Treas. Dpt. at office Sup. Archt., U. S. Post office. Noted July 23.

Oregon—JETTY—U. S. Eng. Office, Post Office Bldg., Portland, bids about Aug. 20, 7,500 ft. jetty, raising, repairing sunken parts old jetty mouth Columbia River.

Pa., Pittsburgh—DREDGING—Aug. 31, by U. S. Eng., Pittsburgh, dredging lower approach channel, Lock No. 7, Allegheny River; adv. E.N.-R. Aug. 6.

Tex., Crockett—POST OFFICE—Aug. 18, by Treas. Dpt. at office Sup. Archt., U. S. Post office.

Tex., Galveston—IMMIGRATION STATION—Sept. 1, by Treas. Dpt., at office Sup. Archt., 3 story, 100 x 180 ft. immigration station, 17th and Strand Sts. $375,000. Bottomley, Wagner & White, 60 East 42nd St., New York, archts. Noted Apr. 23.

Utah, Salt Lake City—HOSPITAL—Aug. 18, by U. S. Veterans Bureau, Wash., D. C., radial brick chimney in connection with veterans hospital. L. H. Tripp, dir., Arlington Bldg., Wash., D. C. Noted July 9.

Va., Langley Field—GUARD HOUSE—Aug. 28, at office Con. Q.M., Langley Field, guard house; adv. E.N.-R. Aug. 6.

Wash., Sumas — INSPECTION STATION—Aug. 24, by Treas. Dpt. at office Sup. Archt., U. S. Inspection station.

CONTRACTS AWARDED

Ala., Mobile—DREDGING—U. S. Eng., dredging 28.5 mi. in Mobile Bay Channel, by own forces. $175,745. Noted June 4.

Ala., Montgomery—ROADS, etc.—Con. Q.M. Maxwell Field, storm sewers in Maxwell Field to Hornbuckle Constr. Co., McGlown-Brown Bldg., Atlanta, Ga., $20,900; c.i. outfall sewers to A. J. Heimnette Co., Birmingham, $48,569; sanitary sewers to Corey-Reed Co., Lexington, Ky., $5,871; concrete and graveling to Reed Batson Co., Inc., 923 1st. Nat. Bank Bldg., Birmingham, $69,044 and $13,270 respectively. Grand total $157,654. Noted June 18.

Calif., San Francisco—ROCK REMOVAL—U. S. Eng., Custom House, 39,800 cu.yd. rock in San Francisco Bay to Siems Helmers, 206 Sansome St., $446,954. Noted May 28.

Conn., New Britain—POST OFFICE—Treas. Dpt., at office Sup. Archt., U. S. Post Office, to New England General Contg. Co., 341 State St., New Haven, $125,000. Noted July 7.

Illinois—EARTHWORK — U. S. Eng., 428 Custom House, St. Louis, Mo., 157,000 cu.yd. earthwork in constructing and enlarging levee in Crane Creek Drainage and Levee Dist.,

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Federal Government (Continued)

Schuyler Co., to Union Constr. Co., 2nd Ave. and New York Ave., Des Moines, Ia., at $0.249 per cu.yd. Noted June 25.

Illinois—EARTHWORK—U. S. Eng., 428 Customhouse, St. Louis, Mo., placing 287,000 cu. yd. earthwork on South Beardstown (additional) Levee, South Beardstown and Levee District, to Union Constr. Co., 2nd and New York Aves., Des Moines, Ia., at $0.1731 per cu.yd. Noted June 4.

Louisiana—EARTHWORK—U. S. Eng., New Orleans, 570,000 cu.yd. earthwork on south bank Red River, Poland Levee and Colonge Bend Levee to Howard Kenyon Dredging Co., 3603 McKinney St., Houston, Tex., $50,559—900,000 cu.yd. in Atchafalaya Front Levee, Australia Point Levee to Lewis Chambers Constr. Co., Canal Bank Bldg., New Orleans, $115,000.

Me., Hallowell—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office to Plante & Sons, Saco, $46,996. Noted June 11.

Mich., Selfridge Field — SHOP and WAREHOUSE—U. S. Eng., at office Con. Q. M., 1 story, rein.-con., brick, steel, plain found., for machine shop, warehouse and 4 double hangars, to Baurbrook Gowan Co., 4829 Woodward Ave., Detroit. Est. $250,000. Noted June 25.

Missouri—DIKES—U. S. Eng., 428 Custom House, St. Louis, 5,180 ft. dikes in Missouri River, to Bilhorn, Bowers & Peters, Railway Exch. Bldg., St. Louis, $101,580. Noted June 11.

Mo., Farmington—POST OFFICE—Treas. Dpt. at office Sup. Archt., concrete brick, steel, post office to McCarthy Bros., Watson St., St. Louis, $65,450. Noted July 7.

Montana—ROADS—U. S. Eng., Portland, Ore., constructing 11.93 mi. Yellowstone Park Hy. A. Carbon Co., to Morrison Knudsen & McDonald & Kahn, Financial Center Bldg., San Francisco, Calif., $419,330, 25.16 mi. Yellowstone Park Hy. B, Carbon Co., to McNutt & Pyle, Eugene, Ore., $477,772.

Mont., Helena—HOSPITAL—U. S. Vet. Bur., Arlington Bldg., concrete, brick infirmary building, incl. boiler house for U. S. Veterans Hospital, to Murch Bros. Constr. Co., Railway Exch. Bldg., St. Louis, Mo., $307,500. Noted June 4.

Nev., Boulder City—ADMINISTRATION—Bureau Reclamation, Denver, Colo., excavating, grading sites for administration, dormitory and hospital buildings, to Storm & Mahoney, Las Vegas, $29,485. Noted June 11.

Tenn., Memphis—EARTHWORK—U. S. Eng., Memphis, 335,000 cu.yd. earthwork to Rodgers, Jones & Uzzelle, Memphis, $59,965; 65,000 cu.yd. to O. Kocktuzky, Blytheville, Ark., $12,740; 574,000 cu.yd. to Callahan Walker Constr. Co., 1,200 1st Natl. Bank Bldg., Omaha, Neb., $74,218; and 50,000 cu.yd. to Henry Hughey Co., Memphis, $11,000, all foregoing in Lower St. Francis Levee Dist. Grand total, $157,923. Noted June 25.

Texas—AIRWAY LIGHTING—Dpt. of Commerce, Wash., D. C., airway lighting on Los Angeles-Amarillo Airway Line, incl. installing beacons, erection towers, constructing markers and lighting intermediate fields, Winslow-Albuquerque Section, to W. C. Schmitt, Portland, O., $15,953; Albuquerque Section, to R. C. Whitlock, Colorado Springs, Colo., $35,882; Kingman-Winslow Section, to McCormick Co., Joplin, Mo., $32,314; Daggett-Kingman Section, to City Improvement Co., Berkeley, Calif., $7,155. Grand total $91,304.

Tex., El Paso — PRISON — Bureau Prisons, Dpt. of Justice, 2 story, part basement, irregular shape, rein.-con., stone, terra cotta, to R. E. McKee, 1932 Texas St., $305,900. Noted June 4.

RAILWAYS

CONTRACTS AWARDED

Pennsylvania and Maryland—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Station, Phila., Pa., concrete catenary foundations for electrification main line from Berryville, Pa., to Baltimore, Md., incl. 16,000 yd. excav., reinforcing steel, etc., to J. F. Casey Co., Aspinwall, Pa., $500,000.

Oregon—Great Northern Ry., J .R. W. Davis, St. Paul, Minn., ch. engr., constructing 1st unit rebuilding program, 10 mi. main line track between Benham Falls and Wanoga, to Hauser Constr. Co., Portland; total est., $1,000,000. Noted Apr. 23.

SUBWAYS AND TUNNELS

CONTRACTS AWARDED

Mass., Cambridge—Harvard University, concrete tunnel, Plympton St. to C. S. Cunningham & Sons Constr. Co., Statler Bldg., Boston. Est. $25,000.

New York—Bd. Transportation, direct current connection and track bonding to B. T. and J. J. Mack, Inc., 160 Bway., $150,000.

Pa., Phila. — Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Contr. 250 Market Street Subway, pedestrian concourse south side 12th St., to Kaufman Constr. Co., 26 South 15th St., $52,671. Noted July 16.

Pa., Phila.—Dpt. City Transit, City Hall Annex, Contr. 317 wall tile finish for subway at Ridge Ave., and 8th St., to Central Brick & Tile Co., 1635 North Broad St., $65,034. Noted June 19.

GRADE CROSSINGS

PROPOSED WORK

N. J., Hasbrouck Heights — Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, and State Hy. Comn., Trenton, eliminating Williams Ave. grade crossing. **Maturity in November.** $250,000. Noted Feb. 19.

N. J., Kearney (br. Newark)—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, bids about December, eliminating 3 grade crossings on Belleville Turnpike. $450,000. Private plans. **Maturity about December.** Noted Nov. 13.

N. Y., Hoosick—Boston & Maine R.R., W. J. Backes, ch. engr., Boston, Mass., plans reconstructing railroad bridge carrying railroad over Hoosick-North Hoosick County Hy., $54,400.

Texas—State Hy. Comn., N. R. Ely, chn., Austin, soon takes bids 502 ft., steel and concrete I-beam overpass over Missouri, Kansas & Texas R.R. Federal Aid Project 605-B, McLennan Co., $50,000. H. C. Porter, Provident Bldg., Waco, resident engr.

BIDS ASKED

Mass., Boston—Aug. 11, by Dpt. P. Wks., underpass Charles St. at Cambridge St., Boston Proper. Est. exceeds $25,000. J. A. Rourke, Dpt. P. Wks., comr.

N. Y., Hempstead—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Sta., New York, bids about Sept 1, reconstructing railroad bridge carrying railroad over Jericho Turnpike. $94,000. Part of work by day labor, $15,000.

Okla., Tulsa—Aug. 18, by City Commissioners, E. Logan, aud., 400 ft. rein.-con. viaduct over 3rd St. and Missouri, Kansas & Topeka R.R., $100,000. Cochran, Wood & Witten, Lynch Bldg., Tulsa, engrs.

Tex., Waco—City, c/o E. E. McAdams, city mgr., St. Louis Southwestern Ry. Co., W. S. Hanley, Tyler, ch. engr., and Missouri, Kansas & Texas R.R. Co. of Texas, F. Ringer, Dallas, ch. engr., soon lets general contract 280 ft. long underpass, 24 ft. wide, earth approach and concrete retaining walls, 7th St. $75,000. Some of work to be done by own forces.

CONTRACTS AWARDED

N. Y., Binghamton — Erie R.R. Co., 50 Church St., New York, and 90 West St., New York, eliminating Liberty Street Grade Crossing to Hecker-Moon Co., Canal and West 3rd Sts., Cleveland, O., $261,015 est. $416,292. Noted July 16.

N. Y., Chenango — Delaware, Lackawanna & Western R.R. Co., G. J. Ray, ch. engr., Hoboken, N. J., structural steel for eliminating Gulf Bridge highway crossing to American Bridge Co., 71 Bway., New York, $5,185. Noted Oct. 30.

N. Y., East Syracuse — New York Central R.R. Co., F. B. Freeman, ch. engr., 366 Lexington Ave., New York, reconstructing bridge carrying Bridge St. over tracks to Walsh Constr. Co., Herald Bldg., Syracuse, $106,807 est. $158,884. Noted Dec. 18.

N. Y., Hillburn—Erie R.R. Co., G. S. Fanning, 50 Church St., New York, eliminating grade crossing on Suffern Village-Hillburn Village State Hy. to American Bridge Co., 71 Bway., New York, $30,047 est. $41,580. Noted July 2.

N. Y., Nelliston—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, reconstructing bridge carrying River Street over tracks to Walsh Constr. Co., Herald Bldg., Syracuse, $53,838. Est. $68,335. Noted July 31.

N. Y., York—Genessee & Wyoming R.R. Co., M. B. Fuller, pres., Scranton, Pa., reconstructing bridge carrying Pavillion-Pifford County, Hy. over tracks to Clarence A. Foote & Son, Mount Morris, $28,259. Est., $52,815. Noted Sept. 11.

DAMS

PROPOSED WORK

Kan., Ozawkie — Delaware River Drainage Dist., bids in fall flood control improvements, incl. 400,000 cu.yd. excav., Kansas Eng. Co., 601 Kansas Ave., Topeka, engrs.

Pa., Torrence—See "Waterworks."

PIERS AND WHARVES

CONTRACTS AWARDED

Calif., San Diego—PIER—Superintendent of Purch. Dpt., improving Broadway Pier, incl. altering freight sheds and offices, constructing passenger and freight depot, to Lynch Constr. Co., 730 Gage St., Los Angeles, for Common Council, $220,870. Noted June 26.

Calif., San Francisco—PIERS, etc.—California State Board of Harbor Comrs., Ferry Bldg., stucco bulkhead building, Pier 39, extending Pier 39, constructing steel frame shed, to Healy-Tibbitts Constr. Co., 64 Pine St., $132,400. Noted June 25.

AIRPORTS

PROPOSED WORK

Mass., Norwood — Aviation Country Club, Inc., 551 5th Ave., New York, O. Payson, Boston Airport, East Boston, plan aviation country club, hangar, landing field, etc. **Maturity in September.** Black & Bigelow, 551 5th Ave., New York, engrs. Noted Mar. 26.

Mo., Kansas City—Transcontinental & Western Air, Inc., plans by Alonzo & Geutry, Fairfax Bldg., 1 story, 120 x 400 ft., brick, steel hangar at Municipal Airport. $160,000.

N. J., Bordentown—Airway Express Corp. of America plans 100 x 100 ft. steel and concrete hangar. $60,000. L. S. Kaplin, 33 West State St., Trenton, engr.

N. C., Durham—City making estimates for airport on land tendered by Duke University, west of here. H. W. Keuffner, Durham, dir. P. Wks.

Pa., Mifflin—Pittsburgh Airways, Inc., Arrott Bldg., Pittsburgh, J. D. Condon, pres., plans hangar, at municipal airport. $70,000. Private plans.

POWER AND LIGHTING

PROPOSED WORK

Calif., South San Francisco — City Council plans ornamental street lighting system, incl. underground system on Grand Ave. Est. exceeds $25,000.

N. J., Ventnor—Bd. City Council, City Hall, will not construct traffic lighting system on Ventnor and Atlantic Aves. Project abandoned. Est. $25,000. E. D. Rightmire, 530 Guarantee Trust Bldg., Atlantic City engr. Noted June 25.

Okla., Bristow — City Council preliminary plans natural gas system. $100,000. C. J. West mayor. Engineer not selected.

BIDS ASKED

Ind., Lowell—Aug. 12, by V. K. Roberts, trustee electrical fixtures, wiring, appurtenances for 8 room school for Bd. School Comrs. $25,000. K. D. Norris, East Chicago, engr.

Pa., Phila.—Aug. 11, by Dpt. City Transit, City Hall Annex, C. E. Myers, dir., electric lighting system on Market St., Pedestrian Concourse, south side of 12th St. and Market Street Subway.

CONTRACTS AWARDED

New York and **New Jersey**—Port of New York Authority, J. F. Galvin, chn., 8090 8th Ave., New York, electrical equipment and installing on Kill van Kull Bridge between Bayonne, N. J. and Port Richmond, N. Y. to W. J. Coleman, 110 Oakland Ave., Jersey City, N. J. $76,606. Noted July 2.

Tex., Beaumont—Gulf States Utilities Co., 26 mi. 33-kv. transmission line extension on Bolivar Island, to serve High Island oil field, from Fannett to High Island, single wood pole construction, timber pole H-frames for 6 mi. terminating at steel outdoor sub-station at High Island. $80,000. By own forces.

PARKS AND SPORTS

PROPOSED WORK

Calif., Martinez—W. P. Kyne, 1945 Bway., San Francisco, plans horse racing tracks, stables, clubhouse, in county, exact location withheld. $300,000. Engineer not appointed.

Ind., South Bend—M. Carroll, 713 Linwood Blvd., sketches field house. $600,000.

Mass., Chatham—Town, Bd. Selectmen, plans 2 story, timber gymnasium, school addition, Main St. $25,000 or more. Architect not appointed.

N. J., Freehold—Bd. Freeholders, Monmouth Co., Court House, swimming pool on Lake Topanemus. $25,000. Project abandoned. G. K. Allen, 60 Broad St., Red Bank, co. engr. Noted June 25.

N. J., Jersey City — State Bd. Educ., State Normal School, grading, replacing top soil, concrete walks, steps, drains, catch basins, concrete sundial base, fountain, landscaping work at State Normal School to W. Williams, Hawthorne.

N. J., Maplewood—Maplewood Club, 11 Claremont Ave., concrete, tile, swimming pool, on grounds. $25,000. Project abandoned. D. W. Wright, 79 Woodland Rd., engr. Noted June 18.

N. J., Ocean City—Bd. City Comrs., City Hall, will not construct new city park at 6th St. and Atlantic Ave. $50,000. **Project abandoned.** W. K. Collisson, Jr., city engr. Noted Mar. 5.

N. J., Paterson—Bd. City Comrs., City Hall, bids in August, 7,500 seating capacity rein.-con., steel stadium, Monument Heights. $100,000. Fanning & Shaw, 49 Ward St., engrs. Noted June 25.

N. Y., Brooklyn—Young Israel Synagogue, 50th St. and West 14th Ave., postponed taking bids pool and baths, 50th St. and West 15th Ave., until late September. $40,000. Slee & Bryson, 16 Court St., archts. Noted June 25.

BIDS ASKED

Wyo., Casper—Aug. 7, by J. H. Arbuckle, clk. of Bd. Educ., Natrona Co., gymnasium, $75,000. Goodrich & Grusmask, Casper, archts.

CONTRACTS AWARDED

Me., Kents Hill—Maine Wesleyan Seminary and Women's College, E. G. Manning, chn. Com., 1 story, brick, steel gymnasium, Seminary grounds, plain found., to E. F. Maxim Co., 520 Main St., Lewiston. Est. $40,000. Noted July 9.

N. Y., New York—Park Bd., W. R. Herrick, pres., Park Bd., Arsenal Bldg., Central Park, repairing sheet asphalt parks and parkways, to Brusstar Constr. Co., Harlem River and 151st St., Bronx, $13,090. Noted July 9.

HEATING AND VENTILATING

BIDS ASKED

Ind., Schider—Aug. 12, by H. P. Simms, trustee schools, heating plant and system for school building. $25,000. Private plans.

N. Y., Brooklyn—Aug. 10, by W. C. Martin, archt. and supt. School Bldgs., Flatbush Ave. extension and Concord St., heating, ventilating, plumbing, electrical work, for additions to P. S. 118, on south side 109th Rd., from 190th to 191st Sts., for Bd. Educ., 500 Park Ave., New York.

N. Y., Hollis—Aug. 10, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extention and Concord St., Brooklyn, heating.

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Heating and Ventilating (Continued)

ventilating, plumbing, drainage, electrical work and lighting fixtures for P. S. 118, 109th Rd., 190th Pl., to 191st St., for Bd. Educ., 500 Park Ave., New York.

UNCLASSIFIED

PROPOSED WORK

N. Y., Brooklyn—COMFORT STATION—Dpt. Parks, W. R. Herrick, pres. Park Bd., Central Park, New York, bids about Sept. 1, comfort station, Bway. Parkway and West 8th St. $40,000. J. S. Kennedy, 157 Remsen St., archt. Noted **Jan. 8.**

N. Y., Elmira—BULK OIL STATION—Sun Oil Co., 1608 Walnut St., Phila., Pa., bulk oil distribution tank, $75,000. **Maturity early in winter.** Private plans. Noted Apr. 9.

N. Y., New York — COMFORT STATION — Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, 2 story, comfort station, Seward Park, Bway. and Hester St. **Maturity in fall.** $115,000. Noted Jan. 30.

N. Y., New York—TELEVISION and BROADCASTING STATION—National Broadcasting Co., 5th Ave. and 55th St., sketches, television and broadcasting station, Empire State Bldg., 34th St. and 5th Ave. Est. exceeds $40,000. Engineering Dept. of owners, O. B. Hanson, in charge, engrs.

Texas—OIL PIPE LINE—Atlantic Oil Producing Co., Magnolia Bldg., Dallas and Longview, preparing surveys 180 mi. 10 in. oil pipe line from Longview to Port Arthur. $2,000,000 Koch & Fowler, Central Bank Bldg., Dallas, engrs.

Texas—PIPE LINE—Texas-Independent Pipe Line Co., Houston, Shamrock Oil & Gas Co., Pittsburgh, Pa., sponsoring project, plan 200 mi., 12 in. bell joint pipe line from point in East Texas to point near Houston. $800,000.

Ont., Toronto—CONCRETE MIXING PLANT—Dual Mixed Concrete & Materials, Ltd., foot of Bathurst St., plans timber, concrete mixing plant, in North Toronto, near Canadian Pacific R.R. station. $50,000. Private plans.

Que., Montreal—FIRE ALARM SYSTEM—Town Council soon takes bids fire alarm system, Montreal East. $33,000. A. Adelard, promayor.

BIDS ASKED

Pa., Carnegie—GREENHOUSE—P. Schreiber, 220 East Main St., taking bids various materials for 40 x 120 ft. greenhouse, 220 East Main St.

CONTRACTS AWARDED

Me., Charleston—COAL POCKET, etc.—Higgins Classical Institute, E. Herrick, pres., 1 story, brick, concrete, coal pocket and boiler house, to W. H. McPherson, 22 Hodson St., Bangor, est. $25,000.

Mass., Boston—RAPID TRANSIT STATION—City and Commonwealth of Massachusetts, rapid transit station and traffic circle, Cambridge and Charles Sts., to J. Slotnick Co., 199 Washington St., $110,484.

N. Y., New York—TRACKS—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., installing tracks and contact rail, part of rapid transit R.R. Route 106, to Faircroft Engrg. Corp., 16 Court St., Bklyn., $529,000. Noted July 7, 1930.

N. Y., New York—STATION FINISH—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., constructing station finish work, 7th Ave. Brooklyn, to C. Meads Engrg. Co., 217 West 14th St., Contr. "A" $369,000.

Pa., Phila. — SUMP PUMPS — Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Contr. 314, 5 electrically operated centrifugal sump pump units, complete for Broad Street Subway, West Philadelphia Branch, to J. Borden & Bros., 6372 North 19th St., $22,772; Contr. 325, 3 mi. single track for Broad Street Subway, to M. and J. McHugh, 892 North Markoe St., $71,996. Noted July 16.

Texas—GAS PIPE LINE—Shell Pipe Line Co., Houston, San Antonio, constructing 10 in. gas welded pipe line from point in east Texas to company's plant and terminal near Houston, to Oklahoma Contg. Co., Allen Bldg., Dallas, Tex., and Oklahoma Natural Gas Bldg., Tulsa, Okla. $375,000.

Texas—PIPE LINE—Texas Pipe Line Co., Big Lake, constructing 31 mi. 8 in. welded pipe line from point 25 mi. west of Galveston over Bay to Texas City, to N. A. Saigh Co., Builders Exch. Bldg., San Antonio, $90,000; 26 mi. 8 in. welded pipe line from Iraan Station to Texon, to C. Rayel, White Deer, $45,000.

MATERIALS

BIDS ASKED

WATER PIPE—**Mt. Shasta, Calif.**—Aug. 14, by E. Toussaint, city clk., 600 ft. 6 in. water pipe.

ALUMINUM SULPHATE—**Oakland, Calif.**—Aug. 12, by J. H. Kimball, secy., East Bay Municipal Dist., 512 16th St., furnishing aluminum sulphate required from Sept. 1, 1931 to Aug. 31, 1932.

ROCK, SAND and GRAVEL—**Oroville, Calif.**—Bd. Comrs. Butte Co. in market for 35,000 tons rock, sand and gravel. Will purchase in open market. J. A. Baumgerner, co. engr.

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ROCK, GRAVEL, OIL, etc.—**Ventura, Calif.**—Aug. 18, by Bd. Supervs. Ventura Co., 10,000 tons crushed rock, 10,000 tons gravel, 10,000 tons sand, 10,000 bbl. road oil, 5,000 tons asphaltum, 10,000 bbl. emulsified asphaltum, for roads.

VALVES, etc.—**Medfield, Mass.**—Aug. 11, by Water Comn., Town Hall, P. Pederzini, chn., and State, furnishing 1 four in. valve, 178 six in., 44 eight in., 7 ten in., 11 sixteen and 1 twelve in. valves, 242 valve boxes, 150 hydrants. J. J. Van Valkenburgh, Irving Sq., Framingham, engr.

TRUCK TIRES—**Brooklyn, N. Y.**—Aug. 12, by H. Hesterberg, pres. Brooklyn Boro, twenty 36x6 solid rubber non-skid truck tires; and 4 power road graders, crawler type complete. MATERIALS

STEAM ASHES—**Long Island City, N. Y.**—Aug 10, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 12,000 cu.yd. steam ashes to Bur. Hys.

ASPHALTIC JOINT FILLER—**New York, N. Y.**—Aug. 13, by S. Levy, pres. Manhattan Boro, Municipal Bldg., 600 tons asphaltic joint filler; 20,000 cu.yd. asphalt sand; 2,500 cu.yd. concrete and paving sand.

CONCRETE, LIMESTONE, etc.—**Edenburg, Pa.**—Aug. 10, by C. E. Whitehill City Council secy., 350 cu.yd. slag, limestone or gravel, 315 tons, sand 3,100 sacks cement, 1,300 cu.yd. slag or limestone suitable for 7 in. waterbound macadam, 17,000 gal. tar or asphalt applied.

STRUCTURAL STEEL—**Phila., Pa.**—Aug. 11, by C. E. Walsh, purchasing agt. Pennsylvania R.R. Co., 15 North 32nd St., Contract 21—structural steel; Contract 2—steel locomotive tires.

CAST IRON PIPE, CASTINGS, etc.—**Ottawa, Ont.**—Aug. 11, by Secretary Bd. Control, furnishing c.i. pipe and special castings, gate valves, check valves, sluice gate, automatic valves, venturi meters, water level controller, pneumatic conveying equipment, alum and lime dry feed machines and equipment, and for supply and installation of chlorine feed equipment. W. E. MacDonald, engr.

CONTRACTS AWARDED

FIRE HYDRANTS—**San Francisco, Calif.**—L. S. Leavy, city purchasing, 200 fire hydrants, complete, 50 extra hydrant bodies for fire department, to M. Greenbergs Sons, 765 Folsom St., $79.47 and $32.47 each respectively.

PIPE—**San Francisco, Calif.**—Bd. P. Wks., City Hall, cast iron pipe, Proposal 732: 10,000 fft. 4 in. and 50,000 ft. 6 in., to Natl. Cast Iron Pipe Co., 571 Mission St., at $0.32 and $0.455 per ft. respectively, 40,000 ft. 8 in. and 5,000 ft. 12 in., to United States Pipe & Fdry. Co., Monadnock Bldg., at $0.6125 and $1.078 respectively.

ASPHALTIC CEMENT—**Long Island City, N. Y.**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 500 tons asphalt cement in tanks to Standard Oil Co., 230 Park Ave., New York, $5,500—200,000 gal. asphalt cement to Warner Quinlan Co. 2 Park Ave., New York, $6,320—20,000 cu.yd. steam ashes to M. F. Hickey Co., foot 6th St., Brooklyn, $23,800; and 3,000 bags portland cement to Peace Bros., Inc., 57 North Lawrence St., Flushing, $1,335. Grand total $36,955 Noted July 16.

CALCIUM CHLORIDE—**Long Island City, N. Y.**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 250,000 calcium chloride to Solval Sales Co., 61 Bway., New York, $15,825. Noted June 29 Daily.

CONSTRUCTION DAILY

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EQUIPMENT

PROPOSED WORK

ROAD BUILDING EQUIPMENT — **Sparks, Nev.**—City, in market for motor truck with dump body, rock crusher, road roller, scarifier, grader, for road building.

TRACTOR—**Plequeasmmock, N. J.**—Township Comrs. purchasing road tractor. $5,000. Coursen & Edwards, township engrs.

BIDS ASKED

POWER RECTIFIER EQUIPMENT — **Phila., Pa.**—Aug. 18, by Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Contract 219—two units mercury arc power rectifier equipment for Subway Station 6, Broad Street Subway.

MECHANICAL EQUIPMENT — **Sugarland, Tex.**—Aug. 12, by State Bd. Control, Austin and Sugarland or Giesecke & Harris, archts., Austin and Sugarland, furnishing builders hardware, mill work, electric elevator, packing plant machinery (meat and vegetables); laundry machinery, dairy machinery, kitchen equipment for use at state farm near here.

FOREIGN

Argentina, Buenos Aires—Provincional Government, c/o Ministry P. Wks., plans 604 grain elevators along railroad lines serving cereal belt.

Australia, Melbourne—Sept. 15, by Secretary Post & Telegraph Dpt., supply instrument cords.

Egypt, Cairo—Sept. 15, by Ministry of Interior, one 16 hp. oil engine, centrifugal pump, capacity 15 litres per second, manometer 38 meters high, artesian well, steel piping with 200 mm. internal diameter; 10 meters deep; also for cylindrical steel tank, 35 cu.m. for water supply at Guezirah-Chandamel.

Egypt, Cairo—Ministry of P. Wks., bids until Sept. 1, four 150 hp. marine Diesel engines with gear accessories, for propelling coal barges.

New Zealand, Wellington—Sept. 3, by Secretary Post & Telegraph Dpt., 25 telegraph transformers, 50 transmitters, 100 ear phones and 100 mouth pieces.

New Zealand, Wellington—Sept. 8, by Secretary Stores Dpt., General Post Office, 100 cords 4 conductor.

New Zealand, Wellington—Sept. 15, by Secretary Posts & Telegraph Dpt., one thousand 3 way telegraph plugs.

New Zealand, Wellington—Sept. 15, by Secretary Stores Dpt., General Post Office, 200 mountings, dial automatic and 30 spools resistance.

New Zealand, Wellington—Sept. 16, by Secretary Stores Dpt., General Post Office, 26 plates unburnt for replacing chloride type F 15, secondary battery.

New Zealand, Wellington—Sept. 22, by Secretary Stores Dpt., General Post Office, 10 mi. wire annealed copper 1.044 in. vulcanized India rubber insulated, taped and braided, twisted pair, 53 mi. tinned annealed copper wire, approximately 1.036 mi. vulcanized.

New Zealand, Wellington—Oct. 20, by Secretary P. Wks., Supply and Tenders, Com., two 3 phase boosting transformers, complete with accessories, for Arapuni Plant.

Salvador, Santa Anne—Sept. 20, by Municipality, complete street electric lighting.

South Africa, Johannesburg — Sept. 7, by South African Railways and Harbors, Administration, 64,200 gal. motor lubricating oils; 6,700 lbs. cup grease for year ending Dec. 31; also for supply axles, steel wheels and axles complete, and wheel centers for engines, tenders and wagons.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Idaho, Lava Hot Springs—W. R. Godfrey & H. P. Allen soon takes bids hotel. $250,000. W. L. Skidmore, Pocatello, archt. Noted June 11.

Mass., Malden—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., White Plains—Willnath Operating Co., c/o Cherry & Matz, archts., 232 Madison Ave., New York, bids in October, general and separate contracts 6 story, apartments, Bway. Parkway and Windsor Terrace. $160,000.

Ont., Toronto—G. C. Murdock, 18 Wellesley St., taking bids 6 story, basement, brick, concrete, stone apartment. $200,000. E. H. Paisley, Confederation Life Bldg., archt.

CONTRACTS AWARDED

Calif., San Francisco—H. C. Baumann, archt., 251 Kearney St., 7 story, basement, steel, concrete hotel, store, to Cahill Bros., 206 Sansome St., for Allen & Co., 108 Sutter St., $175,000. Noted June 11.

Ind., Spencer—Dpt. Conservation, Indianapolis, state park hotel, on McCormicks Creek Canyon Park, near here, to Krebay Constr. Co., 108 East Pratt St., Indianapolis. Est. $150,000.

Mass., Lynn—Hotel Lenox, V. M. Kavanaugh, pres., 71 Spencer St., 3 story, basement, brick, steel, hotel, plain found., Broad and Exchange Sts. to G. A. Cornet, 14 Central Ave., archt., by separate contracts. Noted June 25.

Mass., Malden—F. Spring, 876 Main St., 3 story, basement, irregular sized brick, stone, concrete apartment, store, concrete found., Main St., separate contracts. $150,000. C. F. Springall, 50 Park St., archt.

Mass., Medford (br. Boston)—E. O'Hare, 323 Mountain Ave., Revere, 3 story, basement, brick, stone, steel, plain found., to Frankini Bros. Co., 30 Mystic Ave. Est. $150,000. Noted May 7.

Mo., Springfield—Syndicate forming of Kansas City and Joplin Men, 8 story, basement, rein.-con., brick, stone apartment, to C. A. Dieter Constr. Co., Springfield. Est. $300,000.

N. J., Atlantic City — Owner, c/o Cook & Blount, archts., 415 Lexington Ave., New York, 12 story, basement, 70 x 70 ft., to A. W. Funk Co., Commercial St., Phila., Pa. Est. $300,000.

N. M., Albuquerque—J. M. Fidel, 5 story, basement, 100 x 142 ft., rein.-con. brick, stucco, plain found., to H. T. Ponsford & Sons, El Paso, Tex., for W. M. Britelle, 615 Sunshine Blvd., El Paso, Tex., $160,000. Est. $225,000. Noted July 16.

N. Y., Brooklyn—Bay State Holding and Development Co., H. Berry, pres., c/o Seelig & Finkelstein, archts., 153 Pierrepont Ave., 6 story, apartment, Grace Court and Hicks Sts. $150,000. Separate contracts.

N. Y., Brooklyn—Hargor Building Corp., H. Gordon, pres., 562 East 92nd St., apartment East 92nd St., Skidmore and Church Aves. $150,000. Separate contracts. I. Kallich, 375 Fulton St., archt.

N. Y., Rego Park—Rego Constr. Co., Rego Park, apartment, Haring St. and 63rd Ave., separate contracts. $150,000. Private plans.

Residential (Continued)

Ont., Toronto—A. G. Penman, 28 Jameson Ave., general contract brick, stone, steel, concrete apartment to Wyatt & Hamilton, 63 Glenmore Ave., $500,000.

CLUBS

PROPOSED WORK

Ind., Bloomington — Bloomington Lodge B.P.O.E., Lodge 446, plans by McGuire & Shook, 941 North Meridian St., Indianapolis, rein.-con., limestone club. $150,000.

N. J., Garfield — Owner, c/o D. J. Conte, archt., 166 Harrison Ave., sketches 2 story, basement, brick, steel club house. $150,000.

N. J., Jersey City—Knights of Columbus, Council 137 c/o T. J. J. Norton, 441 Jersey Ave., will not build 3 story, basement, brick, steel clubhouse, plain found. Project abandoned. $200,000. Kelley & Cowen, 921 Bergen Ave., archts. Noted June 25.

N. J., Newark—Italian Catholic Union Holding Co., c/o J. Centanni, archt., 142 Market St., 2 story, basement, 60 x 100 ft., brick, steel, clubhouse, plain found., D'Auria St. $150,000. Project in abeyance. Noted July 30.

N. J., Newark—Italian Catholic Union Holding Co., c/o J. Centanni, archrt., 142 Market St., soon lets contract 2 story, basement, 60 x 100 ft., brick, steel club, Summer Ave. and D'Auria St. $150,000. Noted May 14.

N. Y., Buffalo—Polish Falcons, 873 Sycamore St., 2 story, basement, brick, steel, clubhouse, incl. 2 gymnasiums, locker rooms, showers, Sycamore St. $250,000. S. Stachowiak, Detroit, Mich., archt.

BIDS ASKED

Mass., Everett—Y. M. C. A., Everett, plans by Parker, Thomas & Rice, 177 State St., Boston, altering and constructing 3 story, basement, brick, stone, steel addition, plain found., Webster and Church Sts., $150,000.

N. J., Clifton—Lee & Hewitt, archts., 152 Market St., Paterson, taking bids, selected list of contractors, 2 story, basement, brick, steel Elks Home, plain found., steam heating, Clinton Ave. for Clifton Lodge B.P.O.E., F. A. Latimer, 725 Clifton Ave. Noted July 2.

HOSPITALS

PROPOSED WORK

Calif., Auburn—Bd. Comrs. Placer Co., plans by W. E. Coffman, Forum Bldg., Sacramento, hospital. $150,000.

Calif., Los Angeles—H. L. Gilman, archt., 753 Kerchoff Bldg., soon lets conntract, 2 story, hospital addition, 610 South St. Louis St., for Santa Fe Hospital Assn., 610 South St. Louis St. $150,000. Noted July 30.

Calif., Los Angeles—Santa Fe Coast Lines Hospital, 610 South St. Louis St., plans by H. L. Gilman, engr. and archt., 610 South St. Louis St., 2 story, 64 x 170 ft., rein.-con., steel sash, ornamental iron, 610 South St. Louis St. $150,000.

Idaho, Blackfoot — State Building Comm., sketches by W. L. Skidmore, Pocatello, and Richards, Lewiston, assoc. archts., mental hospital. $220,000 bonds to be floated for same. Noted May 21.

Mass., Gloucester—Gilbert Hospital, 298 Washington St., plans by Phillips & Halloren, 191 Main St., 3 story, basement, brick, hospital annex, Washington St. $150,000.

Mass., Rutland — Commonwealth of Massachusetts, Dpt. P. Health, sketches by Stevens & Lee, 45 Newbury St., Boston, dormitory, Hospital Grounds. $150,000 or more.

Mass., Waltham—Commonwealth of Massachusetts, W. Merrill, Dpt. Mental Diseases, State House, Boston, takes bids in August, 2, 3 and 4 story, brick, steel, medical and surgical hospital unit. $400,000. G. Robb, 87 Beacon St., Boston, archt. Noted Mar. 5.

Mass., Westboro—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, plans by Desmond & Lord, 1 Beacon St., Boston, 2 story, basement, brick assembly building at State Hospital. $150,000. Noted Feb. 26.

Mich., Detroit—Women's Hospital, 432 East Hancock St., plans by Albert Kahn, Inc., 1000 Marquette Bldg., 4 story, 45 x 168 ft., brick, rein.-con., stone, steel hospital addition, plain found. $150,000.

Minn., Minneapolis—City, Bd. Pub. Welfare, City Hall, 1st unit 4 or 5 story, basement, rein.-con., brick, stone addition to city hospital. $500,000. Croft & Boerner, archts., 1004 Marquette Ave. preparing cost estimates.

N. J., Long Branch—E. C. Hazard Hospital, E. C. Hazard, 81 Washington St., plans by C. C. Hartmann, Greensburgh, N. C., 12 story, basement, brick, steel, Dewey St. and Washington Ave. $1,000,000. **Maturity indefinite.** Noted May 7.

N. J., Morristown—Morristown Memorial Hospital, 66 Morris Ave., sketches by Ludlow & Peabody, 101 Park Ave., New York, 7 story, basement, brick, steel, rein.-con. hospital addition, Morris Ave. $250,000.

N. J., Scotch Plains—Bd. Freeholders Essex Co., Court House, Elizabeth, 2 story, basement, brick, steel sanitarium addition, plain found., Bonnie Burns Sanitarium. $150,000. Architect not appointed. Project in abeyance. Noted June 11.

N. Y., Tottenville (sta. Staten Island)—Richmond Memorial Hospital, 375 Prince Bay Rd., plans by R. W. Gardner, 123 William St., New York, 2 story, basement, brick, steel addition, plain found., Kingsland Ave. and Prince Bay Rd. $150,000. Noted June 11.

Pa., Morganza—Commission of Pennsylvania, Dpt. of Welfare, W. F. Penn., supt., plans by Ingham & Boyd, 1211 Empire Bldg., Pittsburgh, 2 cottage units, probably brick and steel. $150,000. Noted July 9.

Tex., San Antonio — State, State Hospital, South Presa St., plans by M. J. Diehmann, 306 East Commerce St., O. Boese, Builders Exchange Bldg., and H. T. Phelps and Wilder & Smith, Hicks Bldg., general improvements at hospital, incl. dormitory for colored patients, regular dormitory, laundry plant, etc. $175,000. Noted July 9.

BIDS ASKED

Calif., San Francisco—Aug. 12, by S. J. Hester, secy. Bd. P. Wks., City Hall, brick work, tile partitions, furnishing, setting terra cotta cornice, of health center building. Total est. $850,000. Noted July 30.

Mass., Belmont—Aug. 11 by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 1 story, basement, 40 x 403 ft. brick, infirmary at Walter E. Fernald State School, Waverly Dist., plain found., heating, plumbing and electrical work. $150,000. C. H. Hoyt, 8 Beacon St., Boston, archt. Noted July 16.

Mass., Waverly—Aug. 11, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 1 story, basement, 35 x 90 ft. and 40 x 70 ft., brick infirmary unit at Walter E. Fernald School. $150,000. C. P. Hoyt, 8 Beacon St., Boston, archt., and A. B. Franklin, Inc., 38 Chauncy St., Boston, engr. Noted June 4.

Minn., Fergus Falls—Aug. 11, by State Comm. of Administration & Finance, 10 State Capitol, St. Paul, 3 story, basement, rein.-con., brick, stone receiving hospital at State Hospital for Insane. Est. $150,000. Sullivan & Orrfelt, 407 Palladio Bldg., Duluth, archts.

N. J., Long Branch—E. C. Hazard Hospital, E. C. Hazard, 81 Washington St., general contract bids about Sept. 1, 12 story, basement, rein.-con., brick, steel hospital, plain found., steam heating, ventilation, elevators, refrigeration, Dewey St. and Washington Ave. $1,000,000. C. C. Hartmann, Greensburgh, N. C., archt. Noted July 30.

Vt., Waterbury—Aug. 10, by Vermont Hospital for Insane, E. A. Stanley, supt., 3 story, 60 x 142 ft., brick, steel men's unit, hospital. $150,000. F. L. Austin, 240 College St., Burlington, archt., and A. Kellogg, 585 Boylston St., Boston, Mass., engr. Noted May 28.

CONTRACTS AWARDED

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, steel contract for health cents., building, fabrication and delivery, to McClintic-Marshall Co., 2050 Bryant St., $34,300; erection, to Herrick Iron Wks., 18th and Campbell Sts., Oakland, $8,860. Noted July 23.

Nev., Reno—E. H. Beemer, clk. Washoe Co., rein.-con. hospital, to J. C. Dillard, Reno, $198,000. Noted July 9.

N. Y., Staten Island—Dpt. Hospitals, Municipal Bldg., general contract male pavilions, A, B, C and D at New York City Farm Colony, to Longacre Eng. Co., 345 Madison Ave. $506,500, plumbing, to S. Ninskoff, $70,430, electrical work, to Lord Electric Co., 105 West 40th St., $15,750. Grand total $592,680. Noted June 18.

CHURCHES

PROPOSED WORK

Conn., Danbury—Church of Christ Parish, N. H. Robertson, pastor, church, Harmony and West Sts. $150,000. Architect not appointed.

Ill., Peoria — Arcadia Presbyterian Church, 903 Bigelow St., 2 story, basement, 85 x 100 ft., rein.-con., brick, stone, Arcadia St. $200,000. Project in abeyance. Noted May 28.

Mass., Marlboro—St. Ann's Italian Roman Catholic Church, c/o R. C. Gorrani, archt., 175 Green St., Worcester, sketches, 1 story, basement, brick church, Lincoln St. $150,000.

Mass., Marlboro—St. Mary's Roman Catholic Church, J. L. M. Levesque, pastor, 26 Broad St., will not take bids this year, 1 story, basement, 65 x 120 ft., brick, stone, church, Broad St. $150,000. **Maturity 1932.** H. G. Morrissette, 575-A Essex St., Lawrence, archt. Noted Mar. 5.

Mass., Milford — Roman Catholic Dioceses, c/o J. W. Donohue, archt., 1200 Main St., Springfield, 1 story, 40 x 175 ft., brick, artificial stone church, East Main St. $200,000.

Mass., Taunton—St. Marys Roman Catholic Church, J. J. Shay, Broadway, pastor, sketches by J. I. Higgins, Borden Block, Fall River, altering and constructing 3 story, basement, brick convent addition, $150,000.

N. J., Maplewood — Wyoming Presbyterian Church, S. P. Shackleton, chn. building com., 420 Wyoming Ave., awards general contract about Aug. 1, 2 story, basement, brick, steel, $150,000. H. B. Upjohn, Grand Central Terminal, New York, archt. Noted June 18.

N. J., Newark—Owner, c/o E. Gerber, archt., 364 White St., Orange, 3 story, basement, 98 x 100 ft., brick, steej synagogue, plain found., steam heating, $150,000.

O., Columbus — First United Presbyterian Church plans by M. W. Lethley, Springfield, brick, stone, concrete, Drexel Ave. $150,000.

Pa., Pittsburgh—Second Presbyterian Church, C. E. Miller, chn. Building Commission, Jenkins Arcade, sketches by G. E. Savage, Witherspoon Bldg., Phila., 1 to 4 story, basement, 90 x 180 ft., stone, cathedral type church, Sunday school and recreation building stained glass windows, North Ave. and Palo Alto Sts. $1,000,000.

Pa., Pittsburgh — East Liberty Presbyterian Church, Baum Blvd. and South Highland Ave., plans by Cram & Ferguson, 248 Boylston St., Boston, Mass., 1 and 3 story, brick church, chapel and parish house. Est. exceeds $150,000.

Tex., Wichita Falls—First Christian Church, c/o A. F. Wickes, or J. E. Hill, Amarillo, will complete plans and take bids in Fall, 3 story, church. $350,000. Address Board or A. F. Wickes, archt., c/o Dpt. Church Extension, Amarillo.

BIDS ASKED

Mass., Boston—Aug. 7 by New Old South Church, F. D. Putnam, treas. Statler Bldg., altering and constructing 3 story, brick, parish house addition, $150,000. Allen & Collens, 75 Newbury St., archts. Noted July 3.

N. J., Jersey City—Westminster Presbyterian Church, H. L. Wyatt, pastor, 304 Academy St., bids about Sept. 15, 2 story, basement, brick, steel, plain found., 302-304 Academy St. $250,000. W. Newman, 26 Journal Sq., archt.

N. J., Newark—W. B. Willis, archt., 111 Madison Ave., New York, taking bids from selected list of contractors 2 story, basement, tower 80 x 120 ft., brick, steel church, plain found., James and Washington Sts., for Second Presbyterian Church. L. H. Clill, pastor, 294 Mount Prospect Ave. $200,000. Noted July 23.

N. J., Passaic—J. T. Comlet, archt., 26 Piaget Ave., Clifton, taking bids 2 story, basement, 50 x 100 ft. brick, steel church, plain found., Armory Park, for St. Peters and Paul's National Church, J. Wroflewski, pastor, 126 River Dr. $150,000. Noted July 16.

O., Cleveland—B'Nai Jacob Kol Israel Congregation, D. Zelinski, rabbi, 36, Northeast 144th St., taking bids 2 story, basement, 45 x 183 ft. brick, steel, concrete social center building, East 147th St. and Kinsman Rd. $150,000. M. Weis, Union Bldg., archt. Noted June 4.

CONTRACTS AWARDED

Mass., Jamaica Plain—Our Lady of Lourdes Roman Catholic Parish, J. F. Kelley, pastor, 46 Brookside Ave., 1 story, basement, brick, stone, plain found., Montebello Rd. and Marmon St., to Martin W. Ryan, Inc., 763 Mass. Ave., Cambridge. Est. $150,000.

N. J., Dunellen—Poggi & Brazdon, archts., 274 Morris Ave., Elizabeth, general contract 2 story, basement, brick, steel parish house, to C. D. Nonemaker, 705 North Washington St., for first Methodist Church. Est. $150,000. Noted June 18.

N. Y., Hempstead—Epiphany Church, rectory and parsonage, to Skinner & Cook, 60 East 42nd St., New York. Est. $150,000.

N. Y., New York—Madison Avenue Methodist Episcopal Church, 1 story, basement, brick, to Hegeman-Harris Co., 360 Madison Ave., steel, to Geo. A. Just, 239 Vernon Ave., Long Island City. Noted June 11.

Ont., Hamilton—Catholic Diocese of Hamilton, J. T. McNally, Pastor, 354 King St. W., general contract brick, stone cathedral, concrete found., King St. W., to Pigott Constr. Co., Ltd., Pigott Bldg.; excavation to A. Cope & Sons, Ltd., 19 Albert St. Est. $200,000.

Que., Montreal—Roman Catholic Church of St. Denis, 144 x 180 ft. church, Laurier Ave. E., to U. Biolieu Ltd., 4869 Garnier St. $210,000.

SCHOOLS

PROPOSED WORK

Calif., Los Angeles—Owner plans by Austin & Ashley, Chamber of Commerce Bldg., Class A Observatory and Science Building, Griffith Park. $750,000.

Calif., Riverside—University of California, Westwood, plans by G. S. Wilson, 3646 West 9th St., Etymology Building, 2 story, basement, 70 x 100 ft., L shaped, rein.-con., citrus experiment station, University St. $150,000.

Calif., Sacramento—Sacramento School Dist. plans by C. Dean, California State Life Bldg., fireproof Junior College unit. $150,000.

Calif., San Francisco—City Council and Bd. Comrs. San Francisco Co., plans by G. A. Lansburgh, 140 Montgomery St., Class A Junior High School, Appleton St. $600,000.

Calif., San Francisco—City Council and Bd. Comrs. Los Angeles Co., plans by G. A. Applegarth, Claus Spreckles Bldg., 3 story, basement, rein.-con. elementary school building, Connecticut St. $150,000.

Calif., San Francisco—City Council and Bd. Comrs. San Francisco Co., plans by Miller & Pflueger, 580 Market St., Class A school building 30th, 31st, Geary and Balboa Sts. $1,500,000.

Calif., San Francisco—Roman Catholic Archbishop, 1100 Franklin St., plans by H. A. Minton, 525 Market St., girls' school and home, incl. 4 rein.-con. buildings, Silver Ave. $200,000.

Calif., San Jose—State of California, Sacramento, plans by R. Wyckoff, Growers Bank Bldg., 3 story, basement, rein.-con. science building in connection with State Normal School. $200,000. Noted Feb. 19.

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...school (Continued)

Calif., San Rafael—Dominican College, plans by A. Constable, 580 Market St., San Francisco, rein.-con. chapel building, Grand Ave. $150,000.

Conn., Stonington—Town, W. B. Noyes, supt. schools, plans high school. $150,000. Architect not appointed.

Conn., East Haven (br. New Haven)—Town of East Haven School Bd., Town Hall, plans high school, Tyler St. $150,000. Architect not appointed.

Conn., Hamden—Town, R. P. Collins, School Comn., receiving competitive plans brick and steel high school, Dixwell Ave. $500,000. Architect not appointed. Noted Apr. 16.

Conn., Stonington—Town, W. B. Noyes, supt. schools, plans high school. $150,000. Architect not appointed.

Conn., Windsor—Loomis Institute, N. H. Batchelder, head master, gymnasium. **Maturity late fall.** Noted Mar. 19.

Ind., Angola—School Commissioners plans by Pohlmeyer & Pohlmeyer, 260 Central Bldg., Ft. Wayne, 2 story, basement, 120 x 240 ft. stone, rein.-con., brick grade school building. $175,000.

Ind., Elwood—School Comrs. plans by C. Houck, 515 Ashland Ave., Quincy, brick, steel school, Pyre Twp. $150,000.

Del., Marshallton—Delaware School Foundation, A. J. Taylor, vice-pres., Du Pont Bldg., Wilmington, Marshallton Consolidated School 2 story, basement, brick, steel, plain found., Brandywine Hundred Dist. $150,000. **Maturity probably in September.** Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted June 25.

Mass., Cambridge—Commonwealth of Massachusetts, Dpt. Educ., Nautical School, 14 Beacon St., Boston, sketches, 2½ story, basement, irregular sized, nautical training school, Commercial Ave. at Lechmere Canal. $1,500,000. J. C. Spofford, 53 State St., Boston, engr. Noted Mar. 19 under "Boston."

Mass., Dedham—Town, W. M. Browne, chn. Building Comn., sketches by E. T. P. Graham, 171 Newbury St., Boston, 2 story, basement, brick, high school addition, Bryant St. $300,000.

Mass., Lawrence — City, M. A. Landers, mayor, plans brick elementary schools at Auburn and Fairmont Sts., Clark, Sargent and East Haverhill Sts. $150,000. Architect not appointed.

Mass., Marblehead—Town, School Building Comn., sketches by W. H. Quiner, 75 Pleasant St., altering and constructing 2 story, basement, brick high school addition, plain found. $150,000 or more.

Mass., Medford (br. Boston) — City, A. J. Harty, chn. com., sketches by Hutchins & French, 11 Beacon St., Boston, 2 story, basement, brick, school, Forest Park Sect. $150,000. Noted Feb. 5.

Mass., Mittineague—St. Thomas Parish, J. W. Dolan, pastor, 20 Pine St., sketches by J. W. Donahue, 1200 Main St., 2 story, basement, brick, school, assembly hall. $150,000.

Mass., Pittsfield—Roman Catholic Diocese, c/o J. W. Donohue, 1200 Main St., Springfield, postponed taking bids founds. for 3 story, 110 x 285 ft., brick, cast stone parochial high school, Linden St. $350,000.

Mass., Quincy—City, H. M. Muir, supt. schools, plans by Hutchins and French, 11 Beacon St., Boston, and soon takes bids altering and constructing 2 story, basement, brick, school, plain found., Newbury Ave., Atlantic Sect. $150,000. Noted June 11.

Mass., Revere—City, A. Cassassa, mayor, City Hall, altering and constructing brick addition to Centre School. $150,000 or more.

Mass., Saugus—Town, F. Sloan, chn., Building Comn., plans brick, steel high school, Newburyport Turnpike. $325,000. Architect not appointed.

Mass., Wellesley—Wellesley College, Building Comn., science building, College Grounds. $150,000 or more. Architect not appointed.

Neb., Lincoln—University of Nebraska, c/o State Bd. Control, O. R. Shatto, secy., plans by Davis & Wilson, 525 South 13th St., girls' dormitory, rein.-con., brick, stone. $300,000.

Neb., Lincoln—University of Nebraska, c/o L. F. Seaton, operating supt., bids soon 3 story, basement, 45 x 120 ft., rein.-con., brick girls dormitory, 16th and S Sts. $300,000.

N. H., Bethlehem—Town, School Bd., plans by H. H. Owen, 3 North State St., Concord, 2 story, basement, 75 x 145 ft., concrete, brick, grade and high school, plain found. $150,000. Noted June 4.

N. H., Exeter—Phillips Exeter Academy, L. Perry, principal, and Cram & Ferguson, archts., 248 Boylston St., Boston, Mass., soon let contract 3 story, basement, brick, inn and conference building, plain founds., Academy Grounds. $150,000 or more. Noted July 24 Daily.

N. J., Bayonne — Hudson County Parental School, 1241 Hudson Blvd., plans by C. H. Ziegler, 26 Journal Sq., Jersey City, 2 story, basement, brick, steel, limestone, chapel, garage, Hudson Blvd. $150,000.

N. J., Bordentown—Dpt. Institution & Agencies, State Office Bldg., Trenton, 2 story, basement industrial school. $150,000. **Maturity probably in September.** Noted Apr. 9.

N. J., Caldwell—Bd. Educ., High School, sketches by C. W. Wands, 309 Bloomfield Ave.,

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2 story, basement, brick, steel, rein.-con. addition, with gymnasium, auditorium, Central Ave. $150,000.

N. J., Carlstadt—Bd. Educ. will not build Junior High School, 2 story, basement, Lindbergh Field. $150,000. Project abandoned. Noted June 4.

N. J., Cliffside Park—Bd. Educ., Palisade Ave., sketches by R. J. Cadien, 545 George Rd., Grantwood, 2 story, basement, brick, steel, rein.-con. addition, School 3. $150,000. Noted July 2.

N. J., Dover—St. Mary's Parish, R. A. Mahoney, pastor, West Blackwell St., Wharton, sketches 2 story, basement, brick, steel parochial school addition, plain found., $150,000.

N. J., Dunellen—Bd. Educ., Old Market St., 2 story, basement, brick, steel high school, plain found., $150,000. Architect not appointed. **Maturity about September.** Noted June 18.

N. J., East Orange—Bd. Educ., 19 Winans St., plans by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel Junior High School, plain found., North Clinton St. and Renshaw Ave. $250,000. **Maturity about September.** Noted July 2.

N. J., Elizabeth—Bd. Educ., 417 South Broad St., will not build 2 story, basement, brick, steel, junior high school addition, Loomis St. $250,000. Project abandoned. Noted June 11.

N. J., Englewood—Bd. Educ., 11 Engle St., 2 story, basement, brick, steel vocational school. $150,000. **Maturity probably soon.** Architect not appointed.

N. J., Hawthorne — Bd. Educ., Lafayette School Bldg., revised preliminary plans by Fanning & Shaw, 49 Ward St., Paterson, 2 story, basement, rein.-con., brick, steel high school, plain found., Central Tract. $450,000. Noted July 16.

N. J., Hillsdale—Bd. Educ., G. M. Strobsohl, dist. clk., new sketches by Hacker & Hacker, 201 Main St., Fort Lee, Junior High School, 2 story, basement, brick, steel, Demarest Ave. $150,000. Noted June 11.

N. J., Jersey City—Bd. Educ., H. F. Mealia, pres., Administration Bldg., Harrison Ave., plans by J. T. Rowland, Jr., 30 Journal Sq., Grade and High School, 4 story, basement, rein.-con., brick, steel, plain found., Grand Ave. $2,000,000.

N. J., Lakewood—Bd. Educ., Lakewood, revised sketches by C. B. Cook, 505 Bond St., Asbury Park, three 2 story, basement, brick, steel, rein.-con. schools. $250,000. Noted Mar. 26.

N. J., Leonia—Bd. Educ., High School, revised sketches by Hacker & Hacker, 201 Main St., Fort Lee, 2 story, basement, brick, steel high school addition. $150,000 or more. Noted July 2.

N. J., Leonia — Bd. Educ., High School, sketches by Hacker & Hacker, 201 Main St., Fort Lee, 2 story, basement, rein.-con., brick, steel addition, plain found., steam heating. $150,000. **Maturity about Sept. 1.** Noted July 23.

N. J., Linden—Bd. Educ., St. George Ave., bids about Sept. 1, Senior High School, 2 story, basement, brick, steel, rein.-con., St. George Ave. $410,000. H. B. Brady, Inc., 333 North Broad St., Elizabeth, archt. Noted June 25.

N. J., Livingston—Bd. Educ., revised sketches by Guilbert & Betelle, 20 Bradford Pl., 2 story, basement, rein.-con., brick, steel addition, plain found. $250,000.

N. J., Lodi—Bd. Educ., A. Cody, pres., Union St., plans by F. Perrone, Midland Ave., Garfield, Junior and Senior High School, 3 story, basement, brick, steel, Westervelt Pl., 1st and Park Sts., $350,000. **Maturity indefinite.** Noted July 7.

N. J., Montville—Bd. Educ., 2 story, basement, brick, steel, Taylortown Rd. $150,000. **Maturity probably soon.** Architect not appointed.

N. J., Morristown—Owner, c/o W. E. Lehman, archt., 972 Broad St., Newark, 4 story, basement, brick, steel, professional building. $150,000. **Maturity probably soon.**

N. J., Newark—Bd. Educ., City Hall, plans by C. F. Bertrand, 122 Market St., 3 story, rein.-con., brick, steel school addition, plain found. $250,000. **Maturity in November.** Noted June 25.

N. J., New Brunswick—Rutgers College, c/o J. G. Lipman, College Ave., plans by A. Merchant, 1 Elm Row, 2 story, basement, brick, steel, plain found., Soil Science Building, State Experimental Farm. $150,000. S. Shaw & Co., 24 Commerce St., Newark, engrs. Noted Apr. 9.

N. J., Nutley — Bd. Educ., Franklin Ave., plans 2 story, basement, rein.-con., brick, steel Junior High School, plain found. $150,000. **Maturity about October.** Noted July 7.

N. J., Oakhurst—Bd. Educ. Ocean Twp., 2 story, basement, brick, steel school addition. $150,000. **Maturity in September.** W. Pieper, 95 Summit Ave., Summit, archt. Noted June 18.

N. J., Oakhurst—Bd. Educ. Ocean Twp., Bd. Educ. Ocean Twp., plans by E. A. Arend, Kimmouth Bldg., Asbury Park, 2 story, basement, brick, steel grade school, plain found.. $150,000. **Maturity indefinite.** Noted July 23.

N. J., Palisades Park — Joint Bd. Educ., Palisades Park, Ridgefield and Fairview, E. Reilly, trustees, will not build 2 story, basement, brick, steel, rein.-con., regional high school, Moremere Sect. $150,000. Project abandoned. Noted July 2.

N. J., Peapeck—Bd. Educ. of Boros Peapeck-Gladstone, Main St., 2 story, basement, brick, steel school addition. $150,000 Bids in. Project in abeyance. A. Merchant, 1 Elm Row, New Brunswick, archt. Noted June 11.

N. J., Piscataway—Bd. Educ., 2 story, basement, brick, steel school, plain found., Raritan Twp. $150,000. A. Merchant, 1 Elm Row, New Brunswick, archt. $150,000. Project abandoned. Noted May 28.

N. J. Rahway—Bd. Educ., High School (Bldg., revised plans by Seymour Williams, 146 Irving St., Junior High School, 3 story, basement, rein.-con., brick, steel, plain found, steam heating, Central Ave. near St. George Ave. $400,000. Noted June 18.

N. J., River Edge—Bd. Educ., Boro Hall, 2 story, basement, brick, steel. $150,000. **Maturity probably in September.** J. L. Tillack, 173 Main St., Hackensack, archt. Noted July 2.

N. J., Rumson—Bd. Educ., B. H. Borden, pres., 2 story, basement, brick, steel high school, Ward Ave. $150,000. **Maturity in October.** Architect not appointed. Noted June 4.

N. J., Somerville—Bd. Educ., School 1, 2 story, basement, brick, steel, rein.-con. high school addition. $150,000. **Maturity probably soon.** Architect not appointed.

N. J., Spring Lake—Bd. Educ., 3 story, rein.-con., brick, steel high school. $150,000. **Maturity probably in September.** Architect not appointed.

N. J., Teaneck (br. Hackensack)—Bd. Educ. High School, sketches 2 story, basement, brick, steel grade school, plain found. $215,000. Architect not appointed. **Maturity indefinite.** Noted Apr. 23.

N. J., West Fort Lee—Bd. Educ., J. C. Abbott, secy., High School, Fort Lee, sketches 2 story, basement, brick, steel school, plain found., Main and Linwood Aves. $150,000. Architect not appointed. **Maturity about September.** Noted July 7.

Pa., Polk—Polk State School, H. M. Watkins, supt., plans by L. Stevens, 132 7th St., Pittsburgh, infirmary building. $370,000. Noted July 9.

Pa., Pottsville—Bd. Educ., bids soon 3 and 4 story, basement, 246 x 401 ft., rein.-con., brick, steel, stone high school. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, Mo., archt.

R. I., Providence—Providence College, L. O. McCarthy, plans science building, River and Eaton Sts. $150,000 or more. Architect not appointed.

Tenn., Knoxville — University of Tennessee plans by Barber & McMurray Central Bldg., rein.-con. brick physical building $300,000; rebuilding old library for administration building, $150,000; biology building, $150,000. Noted Aug. 7, 1930.

Tenn., Memphis — Shelby Co. plans by G. Mahan & E. Wood, Manhattan Bldg., 2 story high school, Whitehaven Suburb. $150,000.

Tex., Galveston—Bd. Educ., plans by R. R. Rapp, Guaranty Bldg., 2 story, brick, rein.-con., Junior High School, 70,000 sq.ft. floor space, plain found. $325,000. L. D. Royer, Smith-Young Tower Bldg., San Antonio, mechanical engr. Noted June 25.

Tex., Longview—Bd. Educ., c/o H. L. Fasser, Longview, postponed taking bids until January, 2 ward schools and remodeling present ones, $175,000. Architect not appointed. Noted June 25.

Tex., San Antonio—Bd. Educ., Lavaca St., plans by H. P. Smith, Natl. Bank Commerce Bldg. and E. T. Jackson, Builders Exch. Bldg., fireproof Negro elementary and Junior High School. $175,000. L. D. Royer, Smith-Young Tower, mechanical engr. Noted July 9.

Tex., San Antonio—Bd. Educ., c/o J. E. King, pres., Lavacca and Matagorda Sts., plans by Phelps & DeWees, school archts., Gunter Bldg., and R. H. Cameron, Majestic Bldg., 2 story, brick, tile, rein.-con. high school. $150,000.

Tex., San Antonio—Bd. Educ., Lavaca St., plans by A. P. and R. M. Ayres, Smith-Young Tower and R. Kelly Milam Bldg., 2 story, Junior School, North Side, est. $400,000—plans by H. T. Phelps, Hicks Bldg., and H. Steimboner, Western Natl. Bldg., 1-2 story, fireproof elementary school, West Side—plans by R. H. Cameron, Majestic Bldg., G. Willis, Builders Exch. Bldg., and H. S. Green, Alamo Natl. Bank Bldg., 2 and 3 story, 180 x 240 ft., high school, incl. class rooms, auditorium, offices, gymnasium, etc., plain found., est. $750,000—plans by J. Marriott, Natl. Bank of Commerce Bldg., converting present Brackenridge Senior school into vocational school, incl. new machinery and equipment, Presa St., all foregoing brick, rein.-con. construction. L. D. Royer, Smith-Young Tower Bldg., supervising mechanical engr.

Vt., Brattleboro—Town, H. B. Chase, chn. School Bd., sketches by H. K. White, 19 West 44th St., New York, altering and constructing high school addition, Linden St. $150,000.

Vt., Middlebury—Middlebury College, J. J. Fitz, building mgr., library. $200,000. Architect not appointed.

Wis., Milwaukee—Marquette University plans by Kirchoff & Rose, 196 West Water St., 4 story, basement, 124x260 ft., brick, rein.-con. school, North 15th St.

Ont., Toronto—East York Twp., School Sect. 27, W. M. Burgess, 30 Logan Ave., Todmorden, secy., plans by H. D. Martin, 59 Barker Ave., brick, steel, concrete school, Floyd St. and Carlow Ave. $200,000.

BIDS ASKED

Ill., Elgin—Bd. Educ. bids about Sept. 1, 2 story, 150 x 158 ft., rein.-con., brick, terra cotta, school building, incl. auditorium, gymnasium, library, kindergarten, concrete found., built up roofing, DuBois Ave., W. B Ittner, Inc., Continental Life Bldg., St. Louis Mo., archt. Noted June 25.

School (Continued)

La., New Orleans—Aug. 20, by Wogan & Bernard, archt., Canal Bank Bldg., Institutional Group, three 2 story, basement, rein.-con., brick, limestone, pile found., composition and slate roof, Palmetto St. for Sisters of Blessed Sacrament, Palmetto St. $400,000.

Mass., Jamaica Plain—Aug. 13 (extended date), by City of Boston, Dpt. School Bldgs., altering and constructing 2 story, basement, brick, steel addition, plain found., Eldridge Rd. $160,000. J. F. Cullen, 162 Newbury St., Boston, archts. Noted July 30.

Mass., Marlboro—Hillside School for Boys, F. Shuman, pres., 453 Washington St., Boston, taking bids 3 story, basement, brick, administration building and dormitory, plain founds. $150,000 or more. J. F. Bigelow, 64 Highland St., archt. Noted June 11.

Mass., Somerville—City, School Bd., taking bids 2 story, basement, brick, stone, school, plain found., School St. $150,000 to $200,000. J. M. Gray and J. P. Hefferman, 175 High St., Boston, archts. Noted May 28.

Mass., Waltham—Aug. 14, by City, Mayor's Office, City Hall, 2 story, basement, brick, stone, school, plain found., Appleton Park. $150,000 or more. Fay, Spofford & Thorndike, 44 School St., Boston, archts. Noted July 30.

Mass., Winchester—Aug. 20, by Town, Bd. Selectmen, 2 story, basement, brick, stone, steel, high school addition, plain found., Main St. $150,000. R. H. Doane, 60 Batterymarch St., Boston, archt. Noted May 14.

Mass., Winchester—Aug. 20, by Town, Bd. Selectmen, 2 story, basement, brick, stone, steel, Junior High School, plain found., Main St. $250,000. R. C. Sturgis, 120 Boylston St., Boston, archt. Noted May 14.

N. J., Bayonne—Hudson County Parental School, 1241 Boulevard Bayonne, bids about Aug. 15, 2 story, basement, brick, steel chapel and garage, Hudson Blvd. $150,000. C. H. Ziegler, 26 Journal Sq., Jersey City, archt. Noted July 23.

N. J., Caldwell—Bd. Educ., High School, bids about Aug. 15, 2 story, basement, brick, steel, plain found., incl. auditorium, gymnasium, steam heating, ventilating, boilers, metal laths, roofing, paint, pipe, waterproofing, Central Ave. $150,000. C. W. Wands, 309 Bloomfield Ave., archt. Noted July 23.

N. J., Dover—Fanning & Shaw, archts., 49 Ward St., Paterson, taking bids 1 story, basement, brick, steel addition to parochial school, also altering present building, for St. Marys Roman Catholic Church, R. A. Mahoney, West Blackwell St., Wharton, pastor. $150,000.

N. J., Lodi — Bd. Educ., Union St., general contract bids about Oct. 1, Junior High School, 3 story, basement, rein.-con., brick, steel, plain found., 1st and Parks Sts. $350,000. F. Perrone, Midland Ave., Garfield, archt. Noted July 30.

N. J., Maywood—Bd. Educ., Municipal Bldg., bids about Sept. 15, 2 story, basement, rein.-con., brick, steel school, plain found., 1 Maywood Ave. $150,000. G. B. Reeke, 221 Prospect Ave., archt. Noted July 16.

N. J., New Brunswick—Aug. 10, by School Bd. Educ., Senior High School Addition, 1 and 3 story, basement, brick, steel, Delivan St., between Comstock and Livingston Aves. $300,000. A. Merchant, 1 Elm Row, archt. Noted July 16.

N. J., Ridgefield Park—Bd. Educ., Overpeck Twp., G. Northling, dist. clk., bids about Oct. 1, 2 story, basement, brick, steel, Teaneck Rd. $200,000. Hacker & Hacker, 201 Main St., Ft. Lee, archts. Noted Mar. 19.

N. J., Union—Aug. 21, by Bd. Educ., 2 story, basement, brick, steel, rein.-con., plain found., steam heating, Oakland Ave. $300,000. F. A. Elsasser, 1000 Stuyvesant Ave., archt. Noted July 16.

N. Y., South Jamaica—Aug. 13, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, completing and finishing abandoned contract for addition P. S. 123, 119th Ave., 145th to Inwood Sts., for Bd. Educ., 500 Park Ave., New York. Noted Oct. 30.

Pa., Washington—Aug. 12, by Bd. Educ., Carroll Twp., C. P. Wilson, pres., Monongahela, 1 story, basement, 64 v 150 ft., brick, hollow tile, wood joist floor part steel joist elementary school building, Eldora Stop, near here. H. W. Altman, Fayette Title & Trust Bldg., Uniontown, archt.

CONTRACTS AWARDED

Calif., San Francisco—Bd. P. Wks., City Hall, general contract West Portal School addition, 2 story, rein.-con., to J. H. Johnson, Hearst Bldg., $106,873; mechanical equipment, to J. A. Nelson, 10th and Howard Sts., $7,521; plumbing, to O'Mara & Stewart, 218 Clara St., $7,521, electric work, to Lynn & Droit, 2445 Ulloa St., $7,245. Grand total $129,160. Noted July 9.

Conn., Storrs — Connecticut Agricultural College, C. C. McCracken, pres., brick and stone infirmary addition and faculty building, to Manchester Constr. Co., 721 Main St., Manchester. $150,000. Noted July 9.

Ind., Elston—(Fayette P. O.) School Comrs., general contract brick, steel, terrazzo, township grade school, to W. C. Anderson, Lafayette. Est. $150,000. Noted June 25.

Ind., Evansville—St. Antonys Parish, general contract 2 story, basement, 66 x 217 ft., rein.-con., steel, terrazzo, limestone, brick, parochial school, to C. Kanzler & Son, 500 Furniture Bldg., Est. $150,000. Noted June 25.

Minn., Brainerd—Bd. Educ., general contract 2 story, basement, rein.-con., brick, stone, to Askov Constr. Co., Askov, Minn. and Ellsworth, Wis., $157,889. Noted July 16.

Minn., St. Paul—Church of St. John, 3 story, basement, rein.-con. brick, stone addition to school, to McGough Bros., 1954 University Ave. Est. $150,000. Noted Dec. 11.

Mo., St. Louis—Temple Israel Congregation, Washington and Kingshighway Blvds., 3 story, basement, 90 x 130 ft., rein.-con., brick educational building, Washington Blvd. west of Kingshighway, to Fruin-Colnon Contg. Co., 502 Merchants Laclede Bldg. Est. $200,000.

N. J., Morristown—Bd. Educ., 50 Early St., general contract two 2 story, basement wings, one 24 x 240 ft., other 24 x 242 ft., both rein.-con., brick, plain found., to Bontempo & D'Annunzio, 39 Washington St., $95,990; plumbing, to J. F. Smith, 81 Monticello Ave., Newark, $6,770; heating, to J. Wohrle, Tube Bldg., Jersey City, $16,500; electric wiring, to N. H. Egglestein, 432 Belmont Ave., Newark, $4,800; steel and iron work, to Harco Steel Co., 1180 East Broad St., Elizabeth, $3,780. Grand total $127,740. Noted July 16.

N. J., Newark—Congregation Talmud Tarah, 182 Osborne Terrace, 2 story, basement, brick, steel school, plain found., to J. Josephson, 152 Somerset St. Est., $150,000.

N. Y., Fayetteville — School Bd., new high school to Shane Constr. Co., Hills Bldg., Syracuse. $250,000. Noted May 14.

N. Y., New Hartford—Union Free School Dist. 1, general contract senior high school to C. Richards & Son, 248 Elizabeth St., Utica, $166,800; heating and ventilating to P. W. Schneider, Inc., 307 Lafayette St., Utica, $32,168; plumbing to Hameline & Co., 529 Orisk St., Utica, $14,265; and electrical work to H. G. Hatfield Electrical Corp., 28 Bank Pl., Utica, $11,968. Grand total, $225,201. Noted May 22.

N. Y., Sauquiot — Sauquiot Central School Bldg., 2 story, brick, steel, school to P. Jones Constr. Co., 618 Charlette St., Utica, $189,000; heating and ventilating to H. J. Brandeles Corp., 1602 Lincoln Ave., Utica, $32,572.

Ore., Portland—School Dist. No. 1, general contract 3 story, basement, concrete, brick school, to F. S. Starbard & Co., Portland, $199,220; heating, to Globe Plumbing & Heating Co., Worcester Bldg., $30,840; plumbing, to A. G. Rushlight & Co., 381 East Morrison St., $17,643; electrical work, to Dimitre Electrical Co., 1549 Halsey St., $5,300. Grand total $253,003.

THEATRES

PROPOSED WORK

Mass., Newtown — Garden City Auditorium Inc., 15 Deerfield St., Boston, sketches by Henry & Richmond, 12 West St., Boston, 2 story, basement, brick, stone, steel, theatre, 1300 Washington St., West Newtown. Est. exceeds $150,000.

Mo., St. Louis—Syndicate forming c/o S. R. Wilson, plans by G. R. Bartling, Inc., 802-03 Paul Brown Bldg., and take bids in early fall, 3 story, basement, 100 x 150 ft., brick, Algonite stone, steel, Masslingar joist, concrete found., incl. stores, office, ball room, sound picture equipment, cooling system, 911 North Vandeventer Ave. $300,000.

N. J., Asbury Park—Warner Bros. 2 story, basement, brick, steel, plain found., Lake Dr. $250,000. **Maturity late in Spring.** Noted Mar. 5.

N. J., Hackensack—Warner Bros. Pictures, Inc., H. W. Warner, pres., 321 West 44th St., New York, 2 story, basement, brick, steel, plain found., 220-22 Main St. **Maturity after Jan. 1.** T. W. Lamb, 644 8th Ave., New York, archt. Noted Jan. 1.

N. J., Long Branch — Paramount Public Theatres, Paramount Bldg., theatre. $150,000. **Maturity in Feb.** Noted Jan. 15.

N. J., Perth Amboy—Norkin Co., c/o Warner Bros. Pictures, Inc., 321 West 44th St., New York, 2 story, basement, brick, steel, theatre and stores, Smith and Maple Sts. $150,000. **Maturity in Feb. 1.** J. Eberson, 370 Lexington Ave., New York, archts. Noted June 4.

N. J., Plainfield—Paramount Public Theatres, Paramount Bldg., New York, theatre. $250,000. **Maturity in Feb.** Noted Jan. 15.

N. Y., New York—F. H. D. Holding Corp., H. Traub, pres., 309 West 23rd St., sketches by T. W. Lamb, 701 7th Ave., theatre, stores, 261 8th Ave. $800,000.

N. Y., New York—Alurion Realty Corp., W. T. Knight, pres., 60 Wall St., sketches by T. W. Lamb, 701 7th Ave., altering theatre, 254 West 42nd St. $500,000.

N. Y., New York—Melrose Bond & Mortgage Corp., 560 Melrose Ave., P. Murphy, pres., plans by E. De Rosa, 18 East 41st St., 2 story, theatre, Grand Concourse and Mt. Eden Ave., $175,000.

BIDS ASKED

Tex., Amarillo—Aug. 12, by J. N. Beasley & Associates, Fisk Bldg., 5 story, and a 2 story, 90 x 135 ft., theatre and stores building, 9th and Polk Sts. $400,000. W. S. Dunne, Melba Bldg., Dallas, archt. Noted May 21.

CONTRACTS AWARDED

Calif., Long Beach—United Artists Theatres of California, 931 South Bway., Los Angeles, 100 x 145 ft., rein.-con. theatre, to Beller Constr. Co., 6513 Hollywood Blvd., Los Angeles $150,000. Noted Apr. 30.

Calif., Los Angeles—S. C. Lee, archt., 2404 West 7th St., archt., rein.-con., brick theatre, to R. E. McKee, 108 West 6th St., for Fox West Coast Theatres, Inc., 1609 West Washington St., $165,200. Noted July 23.

Calif., Los Angeles—United Artists of California, 931 South Bway., rein.-con. theatres building, Wilshire Blvd., to Beller Constr. Co., 6513 Hollywood Blvd., $150,000. Noted Apr. 23.

Pa., Bradford—Imperial Chain Theatres, Inc., Clark Bldg., Pittsburgh, 1 story, 80 x 145 ft. with 24 x 80 ft. wing, brick, steel, monel metal, 1,000 seating capacity theatre, to Miller Constr. Co., Empire Bldg., Pittsburgh. Est. $200,000. Noted May 21.

BANKS

PROPOSED WORK

N. J., Harrison—Harrison-Kearny Trust Co., M. Riordan, in charge, 117 Harrison Ave., altering and constructing 2 story, basement, brick, steel bank addition, 710 North 4th St. $150,000. Project in abeyance. Salmond-Scrimshaw & Co., 526 Elm St., Arlington, engrs. and archts. Noted July 9.

N. Y., New York—Manufacturers Trust Co., 55 Broad St., plans by Godwin Thompson & Patterson, 19 West 44th St., altering bank and office 39 Beaver St. $300,000.

N. Y., New York — Thompson-Starrett Co., 250 Park Ave., general contractors, erecting steel 30 story, bank and office, to Post McCord, 101 Park Ave., New York; and 10,200 tons structural steel to American Bridge Co., 71 Bway., for Bankers Trust Co., Noted July 2 under "Contracts Awarded."

CONTRACTS AWARDED

Me., Auburn — Auburn Savings Bank, 33 Court St., 4 story, basement, brick, stone, granite, steel, bank and office, plain found., Court and North Main Sts., to J. A. Greenleaf & Sons Co., 20 Washington St. Est. $150,000 or more.

Mass., Boston—State St. Trust Co., State St., altering 4 story, basement, brick, steel, stone, bank, to L. D. Willcutt & Sons, 146 Summer St. Est. $150,000.

Mass., Boston — Boston Five Cents Savings Bank, W. R. Evans, pres., 30 School St., altering and constructing 4 story, basement, brick limestone, steel bank addition, to W. A. and H. A. Root, 250 Stuart St. Est. exceeds $150,000. Noted July 23.

N. J., Harrison—Kearny Trust Co., M. Riordan in charge, 710 North 4th St., general contract 2 story, basement, brick, steel addition, plain found., also altering present building, to Salmond-Scrimshaw & Co., 526 Elm St., Arlington. Est. $150,000. Noted July 30.

OFFICES

PROPOSED WORK

Ia., Spencer—Building Corp., c/o J. O. Birdsall & W. Cornwall, sketches rebuilding McAllister building, 2 story, basement, 140 x 150 ft., concrete, brick, stone, recently destroyed by fire. Architect not appointed.

Mass., Pittsfield—Berkshire Mutual Fire Insurance Co., 25 North St. soon let contract brick, steel, office building addition, East and Wendell Sts. $150,000 or more. Parsons, Waite & Goodell, 1 Beacon St., Boston, archts.

Mass., Pittsfield—Berkshire Mutual Fire Insurance Co., 24 North St., R. A. Barbour, pres., plans brick, steel office, East and Wendell Sts. $150,000. Architect not appointed.

Mo., Kansas City—New York Life Insurance Co., 20 West 9th St. and 51 Madison Ave., New York, plans by Henrici-Lown Eng. Co., 114 West 10th St., remodeling 4 sections of office building, 20 West 9th St. $250,000.

N. J., Montclair—H. and D. Harris, 53 Bloomfield Ave., plans by Starrett & Van Vleck, 393 7th Ave., New York, 2 story, basement, brick, steel department store and office, plain found., southwest corner Church St. and South Fullerton Ave. $150,000. **Maturity about November.** Noted July 23, under "Offices."

N. J., Morrison—Owner c/o W. E. Lehman, archt., 972 Broad St., Newark, sketches 4 story, basement, brick, steel, Professional Building, plain found., steam heating. $150,000.—Noted July 30.

N. J., Morristown—Owner, c/o W. E. Lehman, arch., 972 Broad St., Newark, 4 story, basement, brick, steel, professional building, $150,000. **Maturity probably soon.**

N. J., Newark—Owner, c/o Y. Matsui, archt., 350 5th Ave., New York, will not build office, Park Pl. and Passaic River. $8,000,000. Project abandoned. Noted Feb. 26.

N. J., Paterson—Owner, c/o J. Holt, archt., 134 Market St., 2 story, basement, 75 x 100 ft., brick, steel, stone office and store, Market St. $150,000.

BIDS ASKED

Mass., Boston—Judge Baker Foundation, F. Cabot, pres., Bd. trustees, taking bids altering and reconstructing, 4 story, basement, brick, steel, office, Beacon and Walnut Sts. $150,000 Derby, Barnes & Champney, 3 Joy St., archts. Noted June 4.

CONTRACTS AWARDED

D. C., Wash.—Standard Oil Co. of New Jersey, 241 Pennsylvania Ave., N.W., 6 story, concrete, stone, steel, brick, office and service building, 201-227 B Sts., N.W. to James Stewart Co., 2514 Massachusetts Ave., est. $1,250,000.

Ont., Toronto—Syndicate, 435 Yonge St., Ltd., c/o Sparling, Martin & Forbes, archts., 302 Bay St., general contract 3 story, brick, stone, concrete, office and store, to H. N. Dancy & Son, 459 Dovercourt Rd. Est. $150,000. Noted Dec. 4.

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STORES

PROPOSED WORK

Ga., Savannah — W. T. Grant Co., 1441 Bway., lessee, plans department store. $150,000.

Ill., Englewood (station Chicago) — Owner plans department store. $150,000. W. T. Grant Co., 1441 Bway., New York, lessee.

Ind., New Albany—Owner plans department store. $150,000. W. T. Grant Co., 1441 Bway., New York, lessee.

Kan., Hutchinson—Owner plans department store. $150,000. W. T. Grant Co., 1441 Bway., New York, lessee.

Mo., Kansas City—Owner plans department store. $150,000. W. T. Grant Co., 1441 Bway., New York, lessee.

N. J., East Orange—M. Keating, c/o Mahnken & Schultz, archts., 256 Summit Ave., Union City, 2 story, basement, brick, steel store and office, plain found., Central Ave. $150,000. **Maturity about September.** Noted June 25.

N. J., Hackensack—Boundary Realty Co., S. Kraft, pres., 7 Prospect Ave., plans by L. H. Friedland, 562 5th Ave., 3 story, basement, brick, steel store and apartment, plain found., Essex and Prospect Aves. $150,000. Project in abeyance. Noted July 2.

N J., Jersey City—M. Z. Hurwitz Co., M. Z. Hurwitz, pres., 921 Bergen Ave., brick, steel, stores and office, Newark Ave. and Barrow St., $150,000 W. T. Grant Co., 1441 Bway, New York, lessee. Maturity late fall. Noted Jan. 22.

N. J., Kearny (sta. Arlington)—Avon Building & Loan Association, 159 Midland Ave., will not build 4 story, basement, brick steel store and apartment, Midland Ave. May build smaller project later. L. Kassoff, 164 Market St., Newark, archt. Noted June 4.

N. J., Union City—P. L. Schultz, archt., 256 Summit Ave., 3 story, basement, brick, steel, stores and office, 169-173 Summit Ave., for S. Slatkin, 17 Oak St., Weehawken. $150,000. F. W. Woolworth, Woolworth Bldg., New York, lessee. Noted May 28.

N. Y., Brooklyn—Kings Utica Corp., A. Halpern, pres., 26 Court St., plans by Cohn Bros., 215 Montague St., stores and apartments, Lenox Rd. and Utica Ave. $200,000.

N. Y., Ossining — W. T. Grant Co., 1441 Bway., New York plans department store. $150,000.

N. Y., New York—W. N. Grant Co., lessee, 1441 Bway., plans department store, 181st St. $150,000.

N. Y., New York—L. Jakobson, 261 Bway., 20 story, stores and apartments, 209 East 34th St. **Maturity in November.** $1,000,000.

N. Y., New York — One Hundred Nineteen East 37th Street Corp., J. V. Coyle, archt., 250 Park Ave., bids after Aug. 15, general contract store, garage, 119 East 37th St. To exceed $150,000. Noted June 11.

N. Y., New York—N. Wilson, 232 Madison Ave., 12 story, 100 x 114 ft., 12 story & basement, 100 x 114 ft. store, apartment, 315-323 East 56th St. To exceed $500,000. **Maturity in January or later.** Noted July 23.

N. D., Fargo—Owner, plans department store, $150,000. W. T. Grant Co., 1441 Bway, New York, lessee.

O., Youngstown—W. T. Grant Co., 1441 Bway, New York, lessee, plans department store, $150,000.

BIDS ASKED

N. Y., Astoria—See "Contracts Awarded."

Pa., Pittsburgh—Aug. 10, by R. M. Trimblen, Commonwealth Bldg., Annex, 5 story, basement, 45 x 190 ft., brick, steel store, also wrecking present building, 223 5th Ave., for Richman Bros., 1600 East 55th St., Cleveland, O. $250,000. Noted July 30.

CONTRACTS AWARDED

N. Y., Astoria—Mission Constr. Co., 16 Court St., Brooklyn, 6 story, store and apartment, Academy St. and Bway. $225,000. Separate contracts.

One., Toronto—See "Offices."

PUBLIC

PROPOSED WORK

Calif., Long Beach—PUBLIC UTILITIES—City Council sketches probably 3 story, fireproof, Pacific Ave. $150,000. Architect not appointed.

Mass., Chelsea — SOLDIERS' HOME—Commonwealth of Massachusetts, Administration Comm., Room 308, State House, Boston, sketches by Coolidge, Shepley, Bulfinch & Abbott, 1 Court St., Boston, brick, steel soldiers' home, $300,000. Noted June 4.

Minn., Minneapolis—ARMORY—State, E. A. Walsh, adjutant general, 108 State Capitol, St. Paul, and city, c/o Armory Comm., City Hall, sketches by P. C. Bettenburg, Camp Ripley, Little Falls, 95 ft. high, 260 x 480 ft., rein.-con., brick, stone, Kenwood Parkway and Lyndale Ave. $965,000.

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Mo., St. Louis—MARKET—Bd. P. Serv., 301 City Hall, soon takes bids Biddle Market Building, 1 story, basement, brick, steel, rein.-con., 13th St. L. R. Bowen, city engr. A. Osburg, 301 City Hall, archt.

Neb., Lincoln—MUNICIPAL—City Council, T. H. Berg, city clk., soon takes bids rein.-con., brick, stone, concrete floors, Hay Market Square, between 9th, 10th, P and Q Sts. $150,000. Davis & Wilson, 525 South 13th St., archts.

N. J., Camden — ARMORY — State Military Board, Comm., c/o G. W. Keeps, West and Clinton Sts., plans by A. H. Moses, 333 Arch St., 2 story, basement, 85 x 175 ft., brick, steel, plain found., 7th St. and Cooper River. $150,000.

N. J., Caldwell — BORO HALL — Bd. Boro Council, Boro Hall will not build 2 story, basement, brick, steel boro hall, plain found., $175,000. Project abandoned. Guilbert & Batelle, 20 Branford Pl., Newark, archts. Noted July 16.

N. J., East Orange—FIRE HEADQUARTERS—Bd. City Council, City Council, bids in September 2 story, basement, brick, steel, plain found. W. F. Bower, 437 Main St., archt. Noted July 23.

N. J., Rahway—CITY HALL—Bd. City Council, T. J. Loughlin, pres., 118 Main St., sketches brick, steel, plain found. $150,000. **Maturity probably soon.**

N. Y., Jamaica — ARMORY — Armory Bd. Municipal Bldg., New York, bids after October 1, general contract 166 x 586 ft. armory, 93rd Ave. and 168th St. $1,750,000. C. Mayer, 31 Union Sq., New York, archt. Noted June 4.

N. C., Raleigh — AUDITORIUM — City, F. Page, chn. Comm., plans new city auditorium, $300,000. Atwood & Weeks, Inc., Chapel Hill and Raleigh, engrs. and archts. Noted Apr. 9.

N. C., Raleigh — PRISON — State Building Comm., plans by W. H. Deitrick, Raleigh, new state prison building, Camp Polk, near here, $200,000 to $250,000. Noted July 23.

R. I., Newport—FIRE STATION—City, W. N. Sayer, city clk., sketches by M. Traficante, 175 Taunton Ave., Providence, brick, fire station, Marlborough St. $150,000.

Tex., Big Springs—CITY HALL, AUDITORIUM, etc—City, c/o J. B. Pickle, mayor, soon takes bids city hall, auditorium, and fire station. $200,000. Noted July 2.

BIDS ASKED

Calif., San Francisco—WAR MEMORIAL OPERA HOUSE, etc.—Aug. 11, by San Francisco War Memorial Committee, electrical work and movable electrical equipment for legion building and opera house, Civic Center for City and San Francisco Co. Noted Sept. 11.

Mass., Tewksbury — DORMITORIES — Commonwealth of Massachusetts, Dpt. P. Welfare, State House, Boston, taking bids two 2 and 3 story, basement, brick, steel, irregular sized employees quarters and men's dormitory, plain founds. $150,000. Putnam & Cox, 114 State St., Boston, archts. Noted July 16.

Minnesota—COTTAGES—Aug. 18, by State Comm. of Administration & Finance, St. Paul, two 2 story, basement, rein.-con., brick, stone cottages, at State Colony for Epileptics, Cambridge, $202,000, central heating plant, equipment. $161,000. Ekman, Holm & Co., 701 Phoenix Bldg., Minneapolis, archts. Noted Apr. 30.

Neb., Lincoln—MUNICIPAL—City, T. H. Berg, clk., takes bids about Aug. 10, rein.-con., brick, stone, Hay Market Square. $150,000. Davis & Wilson, 525 South 13th St., archts.

Nev., Boulder City—MUNICIPAL—Aug. 10, by Bureau Reclamation, Denver, 1 story, 40 x 107 ft. municipal building; 2 story, 54 x 138 ft. administration building. S. O. Harper, acting ch. engr.

N. Y., Attica—Aug. 11, by Commissioner Correction, State Office Bldg., Albany, dining, kitchen and bakery building, Attica State Prison.

N. Y., Long Island City—COURT HOUSE—Aug. 10, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., completing, abandoned for 2 and 3 story, municipal and magistrates court house, at Beach 90th and 91st Sts., Beach Channel Dr.

Okla., Tulsa—FIRE ALARM STATION and GARAGE—Aug. 14, by City Commissioners, E. Logan, aud., 1 story, basement, 60 x 72 ft. fire alarm building, rein.-con., brick, plain found., incl. plumbing, heating, also 1 story, basement, 38 x 65 ft. garage, Central Park, for City. $275,000. Smith & Senter, 306 Philtower Bldg., Tulsa, archts.

UNCLASSIFIED

PROPOSED WORK

Me., Portland—ART MUSEUM—Portland Art Museum Society, J. C. Stevens, pres., 477 Congress St., plans addition, High St. $250,000. Architect not appointed.

Mass., Worcester—HOME—Jewish Home for Aged and Orphans, 25 Coral St., revised plans by Fuller & Delano, 44 Front St., 3 story, basement, 90 x 130 ft., brick, tile, stone home, plain found., Kendall Estate. $140,000 or more. Noted July 9.

Neb., Omaha—MAUSOLEUM—W. L. Davidson, Davenport, Ia., plans mausoleum 40th St. and Forest Lawn Ave. $150,000. Architect not appointed.

N. J., Elizabeth—HOME—Home for Aged, 1073 East Jersey St., will not build 2 story, basement, brick, steel home, De Hart Pl. and West Jersey St. $150,000. Project abandoned. Noted July 25.

N. J., Elizabeth—MAUSOLEUM—Owner, c/o F. A. Reed, archt., 1221 East Grand St., bids in September, 1 story, basement, brick, granite, $150,000. Noted July 23.

N. J., Newark—RAILROAD STATION—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., bids in fall, railroad station. McKim, Mead & White, 101 Park Ave., New York, archts. Noted June 4.

N. Y., Paterson—STATION—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, 10 story, basement, brick, steel, plain found, railroad station. $150,000. **Maturity in February.** Noted Feb. 19.

Pa., New Castle—STATION—Baltimore & Ohio R.R. Co., H. A. Lane, ch. engr., Baltimore, Md., and Pittsburgh & Lake Erie R.R. Co., A. R. Raymer, assistant vice-pres. and ch. engr., Pennsylvania & Lake Erie Terminal Bldg., Pittsburgh, plans remodeling station, incl. new 23 x 200 ft., brick, red tile, terra cotta waiting room, shelter canopies, concrete platforms, extending Baltimore and Ohio subway, track changes. $250,000, A. C. Clark, Maloney Bldg., Pittsburgh, in charge.

Pa., Torrence—DINING ROOM and KITCHEN—Commonwealth of Pennsylvania Dpt. Welfare, C. R. McKinnis, supt., Torrence, plans by B. H. Prack, 119 Federal St., Pittsburgh, dining room and kitchen. $173,618.

Tex., Houston — PASSENGER STATION — Southern Pacific Ry. Co., G. W. Boschke, San Francisco, Calif., ch. engr. System, plans by Wyatt C. Hedrick, Inc., 1005 1st Natl. Bank Bldg., brick, stone, railroad passenger station, $5,000,000.

Tex., San Antonio—EXCHANGE—Southwestern Bell Telephone Co., c/o H. Martyn, mgr., plans by I. R. Timlin, c/o owners, 100 Pine St., St. Louis, Mo., 2 story, part basement, brick rein.-con., steel, exchange building, incl. new automatic equipment, Warner St. and Frederick Rd., plain found. $150,000. Private plans.

Ont., Toronto—VICTORY—Victory Building, Ltd., c/o Royal Trust Co., 59 Yonge St., plans by Chapman & Oxby, Sterling Tower, completing 22 story, basement, brick, stone, Victory building, Richmond St. Total est. $500,000.

BIDS ASKED

Pa., Pittsburgh—HOME FOR AGED—Aug. 19, by Marks & Kann, archts., Grogan Bldg., brick, steel home near Homestead Bridge, for Jewish Home for Aged, I. A. Simon, in charge Building Comm., Farmers Bank Bldg. $250,000. Noted July 30.

Calif., Los Angeles—LABORATORY—R. K. O. Studios taking bids from selected list of contractors 2 and part 3 story, 92 x 139 ft., rein.-con., clay tile, steel, concrete, terra cotta, granite plaster, incl. freight and passenger elevators, 801 North Gower St. $190,000. Architectural Dpt., c/o owner, archts. Noted June 4.

CONTRACTS AWARDED

Calif., San Diego—STATION—City Council, 2 story, 100 x 1,000 ft., rein.-con. freight and passenger station, Broadway Pier, to land passengers from vessels to station, to Lynch Constr. Co., 730 East Gage Ave., Los Angeles $220,870. Noted July 2.

Conn., Bristol — EXCHANGE — At office D. Orr, archt., 956 Chapel St., New Haven, 2 story, basement, 80 x 115 ft., brick, steel, stone dial exchange, Main St., to Allyn Wadhams Co., 15 Lewis St., Hartford. Est. $150,000. Noted July 30.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Los Angeles—FACTORY and OFFICE—Curtis Mfg. Co., 405 Lane Mortgage Bldg., plans by V. W. Houghton, 617 North New Hampshire St., and soon lets contract 1 story, 57 x 200 ft., brick, steel sash, concrete floors, sawtooth roofing, factory, incl. heating, ventilating systems, fire sprinkler system, water tower with 100,000 gal. tank, galvanized iron roofing, also 2 story, 100 x 100 ft., brick, stucco, art stone, steel sash, plate glass, concrete and wood floors, tile and composition roofing office bldg., San Fernando Rd. and Brazil St. $200,000, C. A. Sanborn & Co., Ltd., 910 Black Bldg., consult., mechanical and electrical engrs.

Calif., Tracy—MILK PLANT—Dairyland Products, Inc., subsidiary of Safeway-McMarr Stores, 5725 East 14th St., Oakland, sketches 48,000 cans milk per day capacity milk plant. Architect not appointed.

Mass., Falmouth—BAKERY—A. G. Cook, Main St., plans 1 and 2 story, bakery, Main St. $45,000. Private plans.

Mich., Detroit—AUTO FACTORY—Chrysler Corp., 341 Massachusetts Ave., Highland Park, plans by Albert Kahn, Inc., 1000 Marquette Bldg., 1 story, 192 x 240 ft., brick, steel, concrete auto factory, plain found., Mt. Elliot Ave. and Lynch Rd. $140,000.

Factories and Mills (Continued)

N. J., Edgewater—FACTORY—Lever Bros., 164 Bway., Cambridge, Mass., plans by Stone & Webster, engrs. and archts., 210 Bway., New York, remodeling 4 story factory. **Maturity after Aug. 15.** Noted May 28.

N. J., Millburn—FACTORY—P. Masella, 40 Main St., will not build 2 story, basement, 45 x70 ft., brick, steel dress factory, $40,000. Project abandoned. E. P. Bonnet, 363 Bloomfield Ave., Montclair, archt. Noted June 18.

N. J., Newark—BEEF COOLER—L. Schloss, foot of Astor St., 1 story, brick, steel, plain found. Astor St. Project in abeyance. $40,000. Private plans.

N. J., Newark — FACTORY — Unique Arts Mfg. Co., 196 Waverly Ave., revised plans by S. Shaw & Co., 24 Commerce St., 1 story, basement, brick, steel, plain found., Waverly Ave. $50,000. Noted May 28.

N. J., Paterson—PLANT—Owner, c/o J. C. Van Blandren, 140 Market St., archts., 1 and 2 story, brick, steel manufacturing plant, plain found. $40,000. **Maturity in October.** Noted July 23.

N. J., Paterson—FACTORY—J. S. Royal, c/o Lee & Hewitt, archts., bids in April, 2 story, basement, 65 x 165 ft., brick, steel, plain found. $40,000. Noted May 14.

N. J., Perth Amboy — DAIRY PLANT — Puritan Dairy Products Co., 61 Madison Ave., 1 and 2 story, basement, 100 x 400 ft., dairy plant. Maturity in winter. $400,000. Ballinger & Co., 100 East 42nd St., New York, archts. Noted Jan. 29.

N. Y., Brooklyn—LAUNDRY—State Laundry, Inc., W. A. Abrahams, pres., plans by T. Goldstone, 141 Joralemon St., 3 story, laundry, Myrtle and Nostrand Aves. $40,000.

N. Y., Mamaroneck—FACTORY—Chatsworth Furniture & Decorating Co., 72 Chatsworth Ave., Larchmont, plans service building, workroom, and store, Boston Rd. $40,000.

N. Y., New York—FACTORY—National Screen Service, Inc., 126 West 46th St., takes bids in August, general contract factory and office, 346 West 40th St. $250,000. Berlinger & Kaufman, 232 Madison Ave., archts.

N. C., Durham — CREOSOTING PLANT — Southern Creosoting Co., plans wood creosoting plant on Southern Ry. 8 mi. west of here. $250,000. C. E. Boesch, pres., Southern Creosoting Co., engr., Durham.

Utah, Provo—LAUNDRY—State Bldg. Comn., Salt Lake, plans by C. Ashworth, and soon takes bids laundry for State Mental Hospital. R. K. Brown, State Bldg. Comn., Salt Lake, engr.

Wash., Okanogan — CHEMICAL PLANT — Pacific States Pulp & Paper Co., Priest River, Idaho, plans chemical plant $75,000.

Ont., Toronto—MANUFACTURING PLANT—Liquia Fibre Co., 362 Bathhurst St., plans roofing paint manufacturing plant.

Ont., Toronto — MANUFACTURING—Oakley Paint Co., 1244 Dufferin St., J. C. Alvey, mgr., plans paint manufacturing plant.

Que., Montreal—PLANT—McKesson & Robbins, Inc., W. N. Van Fant, pres., Grasmere Ave., Fairfield, Conn., plans plant. $1,000,000.

Que., Montreal—PLANT—Rootes Ltd., London, England, plan manufacturing plant. $250,000.

BIDS ASKED

Calif., Los Angeles—DAIRY and GARAGE—Valley Dairy Co., Fletcher Ave. and San Fernando Rd., taking bids, selected list of contractors, 80 x 80 ft., rein.-con., refrigerator doors, tile work, wood and linoleum floors, metal doors, composition roofing, sheet metal, wire glass, plumbing, brick dairy, also 65 x 200 ft. brick garage, Fletcher Ave. near San Fernando Rd. $60,000. T. D. Cooper Co., Western Pacific Bldg., Los Angeles, archt. Noted July 9.

Mass., Willimansett — FACTORY — Palmer Steel Co., 1694 Main St., Springfield, taking bids 1 story, 80 x 180 ft. and 60 x 360 ft., brick, steel, addition, East Meadow St. Est. exceeds $40,000. Private plans.

N. H., Durham—DAIRY—University of New Hampshire, Durham, taking bids fireproof dairy at State College. $40,000 or more. E. T. Huddleston, Main St., archt. Noted Mar. 12.

N. C., Albemarle—MONUMENT PLANT—See "Contracts Awarded."

Tex., Longview — OIL and GAS REFINERY PLANT—Danciger Oil & Refining Co., W. T. Waggoner Bldg., Fort Worth and Longview, taking bids 10,000 bbl. capacity oil and gas refinery plant between here and Kilgore. $200,000. Private plans.

Utah, Provo—LAUNDRY—Aug. 10, by State Bldg. Comn., Salt Lake City, laundry, $40,000. Claude Ashworth, Provo, archt., R. K. Brown, State Bldg. Comn., Salt Lake City, engr.

Ont., Spragge—MILL—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Los Angeles—FACTORY and WAREHOUSE—Austin Securities Co., 727 West 7th St., 60 x 176 ft. factory and warehouse, private spur track, East 12th St., Hostetter Dist., to Austin Company of California, 1626 Cardova St. **Maturity soon.**

Calif., San Francisco — LAUNDRY — Galland Mercantile Laundry Co., 201 8th St., rein.-con. laundry building, to Cahill Bros., 206 Sansome St., $62,000. Former contract recinded.

Calif., San Francisco—LAUNDRY—Galland Mercantile Laundry, 301 8th St., 2 story, rein.-con., 8th St., to J. D. Hannah, 251 Kearney St., $62,500.

Ill., Clearing (sta. Chicago) — FACTORY — Clearing Industrial Dist., 38 South Dearborn St., Chicago, owners and contractors, will build 2 story 135,000 sq. ft. floor space, steel truss, cast stone factory, incl. heating plant, offices, laboratories, cafeteria, hospital, 6901-23 West 65th St. Est. $500,000. Pepsodent Co., 919 North Michigan Ave., Chicago, lessee.

Ind., Evansville—FACTORY—Sunbeam Electric Manufacturing Co., West Morgan St., general contract rein.-con., brick, steel, to M. J. Moffman Constr. Co., 1011 Central Union Bldg., Est. $40,000. Noted July 9.

Ia., Sioux City—COOLING PLANT—Swift Packing Co., U. S. Yards, Packers and Exchange Aves., Chicago, Ill., c/o F. Gale, local mgr., 3100 Valley Dr., 2 story, basement, 62 x 102 ft., rein.-con., brick, to W. A. Klinger, Warnock Bldg. Est. $85,000. Noted July 11.

Mass., Cambridge—PUBLISHING PLANT—Puritan Linotype Co., 65 Austin St., 1 story, brick, steel, addition, concrete found., to F. Santini Constr. Co., 15 Bowdoin St., Arlington. Est. $40,000.

Mass., Charlestown—PLANT—Revere Sugar Refining Co., 333 Medford St., 1 story, steel, concrete, drying building unit to Turner Constr. Co., 137 Newbury St., Boston.

Mass., Dorchester—ICE MANUFACTURING—Boston Ice Co., 11 Deerfield St., Boston, altering 1 story, 100 x 252 ft., ice manufacturing building, to M. P. Standke, 67 Portshire St., Brighton.

Mass., Salem—PLANT—Salem Evening News, 157 Washington St., 2 story, brick, mechanical plant addition, plain found., to Pitman & Brown Co., Washington St. Est. $40,000.

Miss., Jackson—GLASS BOTTLE PLANT—Dixie Glass Bottle Mfg. Co., W. M. Snyder, pres., plant on 5 acre site, to T. B. Scott, Jackson. Noted Oct. 30.

N. J., Newark—FACTORY—Weldon Roberts Rubber Co., 18 Oliver St., 2 story, basement, brick, steel addition, to Lorenz-Haase, 361 6th Ave. Est., $40,000. Noted Mar. 12.

N. Y., New York — LAUNDRY — Cashman Laundry Corp., 369 East 149th St., 3 story, 95 x 275 ft., to Turner Constr. Co., Graybar Bldg. Noted June 11.

N. C., Albemarle—MONUMENT PLANT—Palmer Stone Works, Albemarle, c/o C. M. Palmer, monument plant. $100,000. Day labor under supervision C. M. Palmer. Private plans.

Tex., Longview—REFINERY PLANT—Bell Refining Co., Tulsa, Okla., constructing 10,000 bbl. capacity, refinery plant near here, to Gregg Constr. Co., Longview. $90,000. Also plans constructing 14 mi. gathering lines near here, pipe not bought.

Ont., Spragge—MILL—J. J. McFadden Lumber Co., Spragge, rebuilding timber, concrete found., sawmill, recently destroyed by fire. Day labor. $200,000. Private plans. Noted June 4.

CONSTRUCTION COSTS 1930

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POWER PLANTS

PROPOSED WORK

D. C., Wash.—Potomac Power Co., 10th and E Sts., N.E., plans auxiliary power plant, southwest section. $5,000,000.

Okla., Pryor—City Council preliminary plans electric light plant $40,000. Long & Co., 1300 Colcord Bldg., Oklahoma City, engrs.

BIDS ASKED

Ia., Lake Mills—Aug. 17, by City Clerk, 38 x 52 ft., tile power plant, complete electric distribution system, generating units complete, with generating equipment one 200 hp. and one 280 hp. Diesel engines. $90,000.

Me., Charlestown—Higgins Classical Institute, Bd. Trustees, taking bids brick, concrete boiler house and coal pocket. $25,000. R. D. Kimball Co., 6 Beacon St., Boston, Mass., engrs.

N. Y., New York—Aug. 6, by Dpt. Hospitals, J. G. W. Greeff, comr. Municipal Bldg., general contract, brick, stack boilers and equipment for altering and boiler house additions, City Home, Welfare Island. W. H. Gompert, and K. M. Murchison, 101 Park Ave., New York, archts. Noted May 21.

CONTRACTS AWARDED

Kan., Dodge City—Kansas Power Co., Topeka, 2 story, basement, 50 x 125 ft., concrete, brick, steel, power plant, Ft. Dodge Rd., to L. E. Muyers Co., 53 West Jackson Blvd., Chicago, Ill. Noted May 14.

S. D., Brookings—State College, C. W. Pugsley, pres., general contract power plant addition and 450 hp. boiler, etc., to R. A. Mark, Brookings. Noted June 25.

GARAGES

PROPOSED WORK

Mass., Greenfield—Greenfield Buick Co., J. S. Faulkner, Miles St., plans by F. A. MacSheffray, 857 Commonwealth Ave., Boston, 1 story brick, public garage and sales building addition. $50,000.

N. J., Montclair—White Motor Sales Corp., 640 Bloomfield Ave., service garage, Grove St. and Glenridge Ave. $40,000. Project abandoned. Lewis & Leonard, 51 East 42nd St., New York, archts. Noted Feb. 6, 1930.

BIDS ASKED

N. J., Bayonne—See "Schools."

N. Y., Maspeth—I. Fader, 826 Flushing Ave., Bklyn., taking bids general and separate contracts service garage, 54th St. and Flushing Ave. $40,000. T. Goldstone, 26 Court St., Brooklyn, archt.

Okla., Tulsa—See "Public."

CONTRACTS AWARDED

N. Y., New York—M. Alberti, c/o contractors, service garage, 214 West Houston St., to F. Angelilli, 30 Main St., Yonkers, est. $40,000.

R. I., Richmond — State Dpt. State Police, Everett St., 1 and 2 story, brick, state police garage and barracks, to A. F. Smiley Constr. Co., Oak Hall Bldg., Pawtucket. Est. $50,000 or more. Noted June 25.

WAREHOUSES

PROPOSED WORK

Calif., Los Angeles—Bekins Storage Co., 1335 South Figueroa St., plans by F. E. Barton, Crocker Bldg., San Francisco, 5 story, 80 x 146 ft., rein.-con., composition roofing, hollow tile partitions, steel sash, concrete floors, steel rolling doors, fire alarm system, stand pipes, hose racks, 4th and Alameda Sts. $125,000. E. Ronnerberg, Sharon Bldg., San Francisco, engr.

Me., Brewer — Bangor Box Co., 75 South Main St., plans by F. A. Patterson, 16 Central St., Bangor, rebuilding 2 story, brick storehouse, recently destroyed by fire. $40,000.

Mass., Fall River—Mason Furniture Co., 2nd St., plans by S. T. Dubitsky, Last Bldg., 3rd St., 2 story, brick, steel, warehouse, plain found, 4th St. $40,000.

Mass., Tewkbury—Commonwealth of Massachusetts, Dpt. P. Welfare, plans by Putnam & Cox, 114 State St., Boston, and soon takes bids 2 story, brick, storage building, plain found., at State Infirmary. $40,000.

Mass., West Barnstable—Cape Cod Airport Co., West Barnstable, plans brick, timber storage building. $50,000. Private plans.

N. J., Bayonne—SHIPPING TERMINAL—Bush Terminal, I. T. Bush, pres., Bush Terminal, Brooklyn, N. Y., rein.-con. shipping terminal, Grenville to Constable Hook. $1,000,000. **Maturity after January.** Noted June 11.

N. J., Clifton—Erie R.R. Co., G. S. Fanning, ch. engr., 30 Church St., New York, 2 story, basement, brick, steel, freight house, Nina, Carolina and Rosalie Aves. $150,000. **Maturity in Jan.** Noted June 4.

N. Y., New York—Estate of A. Pell, 910 Park Ave., plans by A. Fisher, 1431 Bway., altering 2 story, storage, workrooms, showrooms, 671 3rd Ave. $40,000.

CONSTRACTS AWARDED

Calif., Los Angeles—See "Factories and Mills."

Ore., Portland—Pacific Cooperative Poultry Producers, 361 East Washington St., 2 story, basement, 100 x 200 ft., concrete office warehouse, dressing and packing plant, to Stebinger Bros., Worcester Bldg. Est. $50,000.

Wash., Seattle—The Pacific Hoist & Derrick Co., 818 First St. S., steel machinery mart, 80 x 200 ft. with craneway extending 50 ft. beyond main warehouse, general contract to General Construction Co., Colman Bldg., furnishing and fabricating 150 tons structural steel, to Isaacson Iron Works, 2917 East Marginal Way. Est. $60,000.

Que., Montreal — Canadian General Electric Co., Ltd., 941 Inspector St., 69 x 154 ft. warehouse, Beaver Hall Hill to G. A. Fuller Ltd., Canada Cement Bldg., $425,000.

Business Opportunities

Projects on which services of consulting engineers, engineers or architects will be required.

Alabama state legislature recently in session, passed a bill to permit the city of Jasper to issue $700,000 bonds for a municipal waterworks system. The Governor is expected to sign the bill.

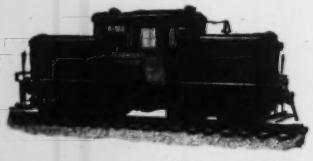
Seattle, Wash., Light Dept. will spend $4,352,972 on new construction during 1932, according to the preliminary budget now under study by the city council.

The city council of Saskatoon, Sask., will soon consider a relief program which includes a concrete bridge at Fourth Ave. to cost $1,250,000, sewage disposal plant $500,000 and storm sewer extensions $300,000.

W. L. Davidson, Davenport, Iowa, plans construction of a mausoleum at 40th St. and Forest Lawn Ave., Omaha, Neb., also an ornamental bridge over Fort Omaha Creek. Estimated cost $160,000. Architect not appointed. (Unverified.)

Constr. News page 57

See proposal advertising on page 95



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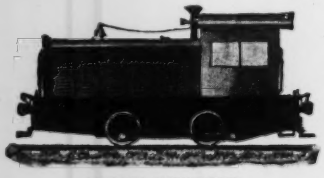

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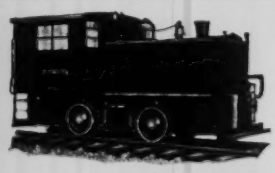

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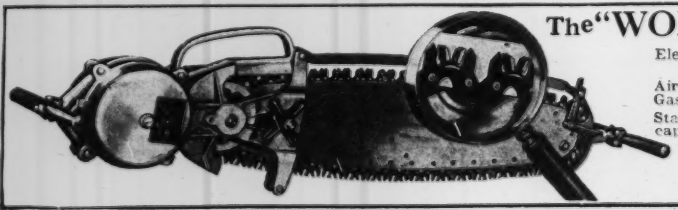

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